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ABSTRACT

The problem of this conference panel was to explore attentional and motivational systems and the factors in classroom management that influence them. The contents of this panel report consist of three approaches to the problem: the study of the psychological state of children as they take part in schooling, with special consideration given to the psychophysiological substrates of attention, to external load factors influencing attention, and to children's conceptions of themselves as learners; programs directed toward children and teachers in the classroom (specifically, the interaction processes that bring about appropriate engagement); and studies of teachers and of the system within which they work. Also included are a list of references and two appendixes: the first is an outline of the original research agenda on attention and motivation, with reactions to the outline; the second contains two papers, one on the acquisition of literacy and the other on teacher development. (JM)

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attention and motivation

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CONFERENCE ON STUDIES IN READING

"It was unlawful, as well as unsafe, to teach a slave to read.

'It will forever unfit him to be a slave. He will at once become unmanageable and of no value to his master.'

These words sank deep into my heart. From that moment, I understood the pathway from slavery to freedom. Though conscious of the difficulty of learning without a teacher, I set out with high hope and fixed purpose, at whatever cost of trouble, to learn how to read."

Frederick Douglass

NATIONAL INSTITUTE OF EDUCATION

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July, 1975

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PANEL 3

ATTENTION AND MOTIVATION

PROBLEM STATEMENT

To explore attentional and motivational systems, and the factors in classroom management that influence them.

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PANEL 3

ATTENTION AND MOTIVATION

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PREFACE

The National Institute of Education (NIE) came into being during 1972. Its authorizing legislation requires the NIE to:

- Help solve or alleviate the problems of, and achieve the objectives of, American Education.
- Advance the practice of education as an art, science, and profession.
- Strengthen the scientific and technological foundations of education.
- Build an effective education research and development system.

In order to aid in meeting these general objectives, the National Council on Education Research (NIE's policymaking body) approved the creation of five priority programs in December, 1973. One of the priority programs was Essential Skills.* Its purpose was:

> To investigate through research and development, ways to aid all children to obtain skills essential for functioning adequately in school and society.

The initial focus of the Essential Skills Program was in the area of reading. Broad guidelines for an NIE effort in reading had been developed in a small conference held on Cape Cod during the late summer of 1973.** During 1974, the Essential Skills Program carried out an intensive effort designed to formulate more specific plans for funding research and development activities in reading. A variety of meetings were held with groups of teachers, school administrators, and scientists to designate directions for the program. The most ambitious of the meetings was held in Washington, D.C., in August, 1974, and directly involved over 175 individuals -- 50 as Conference participants and 125 as consultants to the Conference. This report is the product of one of the 10 panels of the August Conference.

The impetus for the Conference stemmed from a number of concerns about the state of Federal funding of research and development in education. Four concerns stood out in particular for reading.

1. Research in the field of reading was fragmented and noncumulative.

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*During the past few months, the Essential Skills Program has been renamed the Learning Division of the Basic Skills Group. Both the Basic Skills Group and the Learning Division continue to follow the guidelines set out by the National Council in December, 1973 (above).

**See Miller, George A. (ed.) Linguistic Communication: Perspective for Research, International Reading Association; Newark, Delaware, 1974, 45 pp.

2. The Federal Government was not making constructive use of the state of knowledge in the field in their decisions to fund new research and development.

3. There was a lack of positive and firm coordination between the Federal Government and the professional research and practitioner organizations around the country.

4. A large number of scientists in a variety of disciplines carry out research with relevance to reading. We considered it important to attract these scientists to work in the applied areas of educational research.

The Conference itself was a step in meeting these concerns. During the past year, the NIE has been developing plans for funding research and development in reading for the next two years. Suggestions from the Conference have played an important role in this process. But planning is an ongoing process and we hope by publishing and widely disseminating the reports from the Conference to stimulate discussion of the reports, of research and development in the field of reading, and, indirectly, of the plans of the Institute.

To some extent the format for the Conference was influenced by three other similar efforts of the Federal Government. In the area of health research, the conferences leading to the National Cancer Plan and the National Heart and Lung Institute Plan served as partial models. Within NIE, the Teaching Division had held a major planning effort in the area of teaching research during the early summer of 1974. The intent in each of these efforts was to develop a coherent set of documents that would be responsive to the needs of the American public and to knowledge in the field.

We felt it necessary to structure the Conference in two important ways. First, after extensive consultation with scientists and practitioners in the field we arrived at the conclusion that major efforts in the past had often ignored or down-played the critical importance of the stage of reading called "reading comprehension." Although we realized the impossibility of actually separating out "reading comprehension" from the earlier stage of learning to read -- which requires the learner to be able to translate written letters and words into speech -- our advice suggested that the comprehension or "reading for meaning" stage required far more attention than it had received in the past. Consequently, seven of the ten panels focused on problems in this area. Second, to direct the focus of the panels to planning future research we requested the panelists to organize their ideas into general approaches within the problem area, within the approaches to suggest programs for research, and, finally, when possible to specify particular research or development projects.

The seven panels addressing problems in comprehension spanned a wide range of concerns. The first three panels focused on basic research issues. Their panel reports are titled: Semantics, Concepts, and Culture; The Structure and Use of Language; and Attention and Motivation. The fourth panel was asked to consider the problem of Modeling the Reading Process. The fifth panel directed its attention to the issue of measuring how well people read and its report is titled Assessment of Reading Comprehension. The sixth and seventh reports directed themselves respectively at the practical problems of the Application of Existing Reading Comprehension Research and Reading Comprehension and the High School Graduate. The final three panels directed their attention to three pressing concerns in early reading: Learning and Motivation in Early Reading; Reading Strategies for Different Cultural and Linguistic Groups; and Essential Skills and Skill Hierarchies in Reading.

Although the reports have undergone some revision and editing since the Conference, the major part of the work was done in concentrated sessions in the space of a few days. The resulting documents are not polished or exhaustive. They are meant to be working documents to stimulate debate, suggestions, and comments. Such comments or requests for other reports should be directed to:

Director, Learning Division
National Institute of Education
Washington, D.C. 20208

The work of organizing the Conference was carried out by members of the Essential Skills staff at the NIE -- each of the panels had an NIE staff person as a permanent liaison. Special acknowledgments are due to Susan Duffy and Donald Fisher for their assistance in preparing the reports for publication and to Arthur Young & Company for coordination and arrangements before, during, and after the Conference. Finally, the work of NIE cannot proceed without the kind of skill, involvement, and hard work given by the panel chairpeople, panelists, and consultants for this Conference. The ideas and emphases in the reports are the products of their cumulative expertise.

Marshall S. Smith
Conference Chairperson

LIST OF PANEL REPORTS AND CHAIRPERSONS

1. Semantics, Concepts, and Culture, Dr. George Miller, Rockefeller University

2. The Structure and Use of Language, Dr. Thomas Trabasso, Princeton University

3. Attention and Motivation, Dr. Sheldon White, Harvard University

4. Modeling the Reading Process, Dr. Richard Venezky, Wisconsin University

5. Assessment of Reading Comprehension, Dr. Ernst Rothkopf, Bell Laboratories

6. Application of Existing Reading Comprehension Research, Dr. Lauren Resnick, University of Pittsburgh

7. Reading Comprehension and the High School Graduate, Dr. Mina Shaugnessy, City University of New York

8. Learning and Motivation in Early Reading, Dr. Richard Hodges, University of Chicago

9. Reading Strategies for Different Cultural and Linguistic Groups, Dr. Manuel Ramirez, University of California, Santa Cruz

10. Essential Skills and Skill Hierarchies in Reading, Dr. Irene Athey, University of Rochester

PANEL 3

ATTENTION AND MOTIVATION

INTRODUCTION

Problem Statement

This Panel explored attentional and motivational systems, and the factors in classroom management that influence those systems.

The research proposals are directed toward a particular feature of classroom performance, a quality that Hess (1974) observed in classrooms and called engagement. He defines engagement as follows: Attention to tasks, activities, or teachers, in accordance with teachers' instructions, or some spontaneous activity not directed by teachers but clearly relevant to their overall purposes. Weiner (1974) defined a kind of inverse of engagement from her experience with poor readers in high school: "Distractibility resulting from attention to external or internal stimuli (noises or thoughts); inadequate monitoring of incorrect, inappropriate behavior in order to camouflage deficiencies." The proposed set of studies tries to identify the means by which schools might increase engagement in teaching students to read.

We imagine that factors of attention and motivation are involved in whether or not children are engaged. Attentional management refers to selecting information that children will notice and which will have effects on their behavior. Classroom teachers regularly practice attentional management. That is, they are regularly concerned with the moment-to-moment manipulation of the flow of information to the children, the highlighting of intended information, and the suppression of distracting external and internal influences.

Motivational factors presumably allow children to remain engaged over periods of time -- that is, to persist in being effectively attentive. Discussions of the school's role in motivation seem to center around three levels of responsibility: (a) building enduring positive attitudes; (b) avoiding enduring negative attitudes; (c) making the learning process comfortable. Some theorists believe that schools can build enduring positive attitudes toward reading and should be expected to do so; others believe that only family experiences prior to or coexisting with schooling can build these attitudes. Still others feel that schools can practice motivational management only to a limited extent. That is, teachers should act effectively to reduce fear and uncertainty, which often impede student efforts to learn to read. Finally, at the most conservative level, all would probably agree that teachers must be concerned with motivational factors to the extent that they can and should arrange to make school instruction as comfortable, pleasant, and reasonable as possible. Taken together, the management of attentional (short-term), and motivational (enduring) factors define what we will call engagement management.

How much can research on attention and motivation help? It would be a mistake to assume that teachers do not now manage these factors, or that they do not manage them effectively. A high percentage of American

school children do learn to read. Furthermore, inasmuch as research on teaching generally lags far behind the intuitive knowledge teachers use in classrooms every day, it would be presumptuous to assume that the research to be proposed will yield laws and dicta to be taken as prescriptions for teacher behavior. What research might do is make the processes of creating engagement more explicit, toward the following ends.

1. Less-gifted or -motivated teachers might be better able to recognize further possibilities of engagement management.

2. There might be some provision of administrative resources to allow the teachers to act effectively with respect to engagement management in the classroom.

3. Children now sloughed off as "dumb" or "less competent" may come to be recognized and handled as special problems in engagement management.

Division of the Problem Area

We identify reading problems through the behavior of children, and we then confront the issues of attribution. But the locus of the engagement problem is not inevitably in the children, a problem to be diagnosed and fixed by work on the individuals. Three kinds of organization intersect to influence children's behavior: (a) their own organization, their system of engagement with school; (b) the organization of the classroom; and (c) the organization of teachers' activities, reflecting their personal teaching styles and the constraints of the system in which they teach. It seems likely that there should be inquiry directed at all three kinds of organization.

Thus, the work to be discussed will be divided into three kinds of efforts.

The programs of Approach 1 are directed toward study of the psychological state of children as they take part in schooling. Special consideration will be given to the psychophysiological substrates of attention, to external load factors influencing attention, and to children's conceptions of themselves as learners. Approach 2 contains programs directed toward children and teachers in the classroom, in an attempt to study the interaction processes that bring about appropriate engagement. Approach 3 suggests studies of teachers and of the system within which they must work.

Two appendixes are attached to the main report. The first contains an outline of the original research agenda on attention and motivation developed before the panel meeting. It also includes reactions to this outline from a number of field consultants. Because the final report altered some of the emphases, we thought it important to include the original outline and some of the thoughtful responses

to it. Appendix II contains two papers generated by panelists. Each is referenced in the body of the report, and we considered each to be of sufficient importance to include in its entirety.

APPROACH 3.1

RESEARCH ON THE ENGAGEMENT
OF INDIVIDUAL CHILDREN

Approach Statement

Investigate the psychophysiological and environmental factors affecting the engagement of individual children. Investigate the relationship between their understanding of themselves as learners and their engagement in reading-related tasks.

Approach Potential

Research in this section might be expected to (a) move toward more rational premises for practices of classroom scheduling and environmental management; (b) provide systematic data on the influence of factors affecting performance in children at different age levels. So far, developmental psychology has been linked to education mostly through the assumption of a relationship between cognitive development and the substance of school curriculums. There is good reason to believe now that performance factors change with age fully as much as intellectual factors, and that "school readiness" involves both cognitive and performance factors; (c) provide more rational premises on which to design remedial environments for students who have special difficulties with reading.

Within the last decade, research in the neurosciences has progressed enormously. With the advent of biotechnology, we can now look at psychophysiological functions and their behavioral concomitants. We have gained a great deal of knowledge about the mechanisms of learning, attention, motivation, and emotion in adults. However, we have precious little data about the development of these mechanisms. Aside from glib remarks that, often, "reading-disabled" children show "abnormal EEGs" we have no good data base regarding the qualitative and quantitative nature of such "abnormality."

Thus, the first set of research proposals is addressed to the experimental analysis of information processing in children. The studies are aimed at the psychophysiological correlates of attention and the comparison of the development of attentional processes in normal children with that of children with "reading disabilities." Additional proposed studies emerge from the joint consideration of this work together with simple models of information processing.

Although the literature of developmental psychology, children's learning, and educational research is replete with research on

"children's behavior," most of this research suffers from at least two very important limitations: (a) its typical focus is on artificially abstracted behavior episodes, not on the stream of ongoing real-time behavior, and (b) there has been no systematic approach to research on the relationship of external "load factors" (noise, distraction, stress, and so on) to student behavior (performance). There exists a smattering of experiments measuring the effect of load on task performance, but a theory of the relationship between competence and performance is lacking. Thus, the second set of research proposals focuses on the regular and explainable variations of activity level and performance within children, including the relationship of these variations to the formal constraints of the classroom schedule and activities. Finally, the third set of proposals is directed toward investigating the operating characteristics of children engaged in learning to read under varying degrees of external load (interference from environmental noisiness, distracting or multiple demands). A fundamental concept is that we can approximate an understanding of the operating characteristics of children's behavior in the classroom by first understanding their natural competence and then successively reinterpreting our understanding in light of the various demands placed on children within a classroom.

This analysis would benefit from additional investigation of the relationship between children's self-perceptions and their engagement over time. Beginning with Piaget's interest in "reflective operations" and continuing with present American work on metacognitive and metalinguistic awareness, there is increasing interest in theories of children's learning and knowledge. There is good reason to believe that, at about the time that children enter school, they begin to dimensionalize the physical and social world that surrounds them. Because school is so large a part of children's lives, it is likely that a significant aspect of this awareness is the development of a notion of what schooling is all about and what their own place and possibilities in the schooling process are. Further, it seems probable that the children's conception of their role in the classroom is related to their engagement in reading-related activities. The fourth program of Approach 3.1 presents research proposals directed toward these issues.

Program 3.1.1: Substrates of the Attention Process in Normal and Reading-Disabled Children.

Program Statement

Investigate the attentional and information-processing mechanisms which underlie the skills involved in learning to read.

Program Potential

We assume that reading is an information-processing task involving such component processes as encoding, decoding, and comprehension of visual stimuli, organization of coded materials in short- and long-term memory, retrieval operations, and the like. Efficient acquisition and performance of these complex skills presumably depends on factors affecting both short-term attention arousal as well as sustained attention and motivation. Individual differences in the rate of acquisition of reading undoubtedly have diverse etiologies. Thus, one assumes that reading performance is a final common pathway, influenced by the educational system, the classroom environment, the teacher, the family and community, and the attitudes, disposition, capabilities, deficits and developmental status of the children themselves. Although many of these variables may influence children's ability to sustain attention and motivation, the research proposed here will focus specifically on the experimental analysis of certain information-processing abilities. Moreover, though these studies may contribute something to our understanding of the general problem of readiness, most of them are centered on the problem of children who learn to read slowly, poorly, or not at all.

Program Research Considerations

There appear to exist at least two broad categories of children who are slow, poor, or disabled readers. A small percentage are apparently truly dyslexic. Possessed of adequate intellectual ability, normal sensorium, and satisfactory emotional equilibrium, they exhibit specific retardation in the acquisition of "decoding" skills. The larger group of disabled or slow readers shows general developmental lags in perceptual, motor, and linguistic functioning. The studies proposed here will focus primarily on these two groups in an appropriate age range (say 6 to 9), because we assume that children at this level who fail to acquire decoding skills will have trouble developing the higher order comprehension skills that are necessary attributes of good reading performance.

The principal aim of this program is the experimental analysis of information processing in reading-disabled children. The first experiments in the series approach this analysis through studies of certain electrophysiological and psychophysiological correlates of signal detection, set, and attention. Subsequent proposed studies emerge from consideration of some simple models of information processing and memory, and involve a research strategy which may enhance our knowledge of specific processing problems in reading-disabled children.

Project 3.1.1.1: EEG Patterns in Normal and Reading-Disabled Children.

Project Statement

Investigate the frequency-amplitude spectrum of the resting EEG in normal reading and in reading-disabled children.

Project Potential

We have very little data on EEG patterns in children from age 6 to 9. We need to fill in the developmental picture. In addition, the EEG and the new methods of quantitative analysis are particularly sensitive measures of biological rhythms and states of arousal and vigilance (Johnson et al., 1969; Lindsley, 1956; Surwillo, 1963). Variations in these states may prove to be important predictors of receptivity to training in reading. Also, sophisticated techniques of EEG analysis may reveal new aspects of neural dysfunction in certain learning disabled children and evidence of developmental lag in others.

Project Research Considerations

Before recent advances in quantification, EEG studies were based on visual inspection of the frequency and amplitude record, with most of the studies focusing on the 8 - 12 Hz alpha rhythm. The alpha rhythm appears at occipital sites during the first year of life and its parameters show maturation at least to the fifth or sixth year and possibly into adolescence. The frequency, density, and synchrony of the alpha rhythm increase with growth of the child, but individual differences in alpha rhythm parameters and in other aspects of the resting EEG are vast (Henry, 1974), and there is little information on the remaining variables in the EEG spectrum in children at any age.

Until recently, the state of the art in bioelectronics and computer processing did not permit efficient, high speed, and generalized time series analyses of the type required for quantification of EEG data. There now exist several methods for quantitative EEG analysis, each of which has certain advantages and might provide certain insights. The most popular procedures are the following:

Amplitude Analysis. The integration, over brief time segments, of overall EGG amplitude (Drohocki, 1948; Goldstein et al., 1963) and the computation of simple parameters of the amplitude-time function have revealed some interesting correlates of central nervous system dysfunction and psychopathology. For example, Goldstein (1963) and other investigators have shown that certain schizophrenic patients have very low variance in EEG amplitude over time, compared to controls. Amplitude analysis is inexpensive and easy to instrument.

Period Analysis. Special purpose equipment and general purpose laboratory computers can be programmed to count each wave in the EEG, over any designated time interval, and to distribute these counts into EEG frequency histograms (Burch, 1959). This system is limited by the fact that it does not specifically account for amplitude, but because of the normally inverse relationship between EEG frequency and amplitude this limitation is not a serious one. A substantial advantage of period analysis is that it need not rely on averaging over time. The period analyzer can measure and count a given time segment. This feature is useful for the study of transient alterations in the EEG, associated with external or internal events.

Power Spectrum Analysis. This method and certain related systems, such as complex demodulation (Orr and Hoffman, 1974), are regarded as the general systems for time-series analysis of EEG (Walter, 1963; Hord et al., 1965). They are often used to generate spectral histograms revealing average contribution (in terms of density and amplitude) of designated time segments. They are also the most expensive methods to instrument and program but they can be accomplished either on a general purpose laboratory computer or on special purpose devices.

Because we know very little about the developmental properties of the generalized EEG spectrum, and nothing about the relationship (if any) between developmental changes in EEG and corresponding developmental sequences of skill acquisition or cognition, these studies must be considered empirical and descriptive in style. Nevertheless, a finding that the resting EEG of certain reading-disabled children is systematically slowed, of low amplitude, or differentially patterned compared to those of controls, would generate some useful working hypotheses about developmental lag and neural organization in this group.

Project 3.1.1.2: Developmental Changes in EEG Configurations.

Project Statement

Investigate any systematic developmental changes in EEG configurations during the ages of transition to schooling and attempt to correlate these changes with specific maturational changes in other fields, such as cognition, affective control, or the organization of motor behavior.

Project Potential

This investigation would give us a start in developmental psychobiology. One of the more obvious and simple approaches would be to examine the covariation between, say, Piaget's stages of cognitive development and maturational changes in brain electrical activities. A general analysis of biological-behavioral profiles of this sort

would be of value not only for theoretical reasons but also because it would provide a more accurate base for the assessment of attributes involved in readiness for reading and other school-related skills.

Project 3.1.1.3: Periodic Changes in EEG Patterns.

Project Statement

Compare the changes in EEG states over time in both normal and reading-disabled children.

Project Potential

In a general way we know that the modal frequency, the density, and probably the amplitude of the EEG alpha rhythm vary with time of day (Bjerner, 1949). There is certainly a circadian (about 24 hours) cycle for these parameters and there may be ultradian (less than 24 hours) cycles that appear at regular intervals but with varying amplitude throughout the day and night. There is evidence to suggest that these biological rhythms are related to the REM-to-REM sleep cycle. This cycle, probably emerging from the basic rest-activity cycle in infants, shows an increase in the length of the period with maturation, from about 50 minutes in newborns to about 90-100 minutes in adults (Kleitman, 1963). There are one or two studies of adults suggesting a 90- to 100-minute daytime rhythm in performance efficiency (e.g. Orr et al., 1974). The amplitude of the variation of daytime performance is not great in these studies, but note that in adults, superior language skills, effective inhibitory controls, and long-term cognitive plans may serve to override the effects of periodic biological rhythms. It is at least conceivable that in the child these biorhythmic phenomena will mediate much greater variation in performance efficiency. Such findings would, of course, have implications for the timing of classroom training schedules.

Project Research Considerations

Using sequential power spectrums and the condensed spectral format of Bickford et al. (1973) one could examine changing states of the resting EEG over time, both within and between days. Are the parameters of ultradian, circadian, or other EEG cycles altered in some reading-disabled children? For example, is the amplitude of the daytime ultradian rhythm larger in the reading-disabled child than in children making normal progress? A finding of either cyclic or aperiodic high variability in some reading-disabled children would suggest two interesting possibilities for subsequent behavioral studies: (a) learning and performance may show great variation with time of day in these children, and (b) strong state-dependent learning effects may characterize their school performance. That is, there may be a certain set of internal conditions resulting in optimal school performance, and when these conditions are not met, performance

suffers. Something like state-dependent learning is suggested by teachers' reports that some children's memories for previously acquired reading skills appear to be remarkably unstable.

It is important to note that the art of telemetering biological data is now sufficiently advanced that one could telemeter and continuously quantify the EEG from freely moving, active children. Thus, it would be possible to time-sample classroom behavior and EEG (or other biological variables) simultaneously. Janice Stevens of the Oregon Medical School, Portland, is now obtaining 24-hour continuous recording of behavior and EEG, with online quantitative analysis of the latter, in freely moving schizophrenic patients (Stevens, personal communication).

Project 3.1.1.4: EEG Spectrums of Identical Twins.

Project Statement

Investigate the EEG spectrums of monozygotic twins who are discordant for reading ability.

Project Potential

Resting EEG patterns in normal adult monozygotic twins are nearly identical (Lykken et al., 1974). Thus, if we can locate identical twins who are discordant for reading disability, the status of their EEGs is of interest. Discordance of EEG spectrums in monozygotic twins who were also discordant for reading disability would be evidence for profound environmental mediation of reading disability.

Project 3.1.1.5: Sensory Evoked Potentials.

Project Statement

Collect and evaluate sensory evoked potential data collected from normal and reading-disabled children.

Project Potential

Both simple and complex stimuli having reasonably rapid rise times -- such as a flash of light or the sudden appearance of a picture or sound -- cause brief perturbations in the EEG, labeled "evoked potentials." The change in EEG evoked by a single stimulus is small and brief, and it is usually hidden in the complex undulations of the background EEG. However, if we could present the stimuli repeatedly (about 30 at minimum) then the background EEG can be separated from the evoked potential and "filtered out" by a process of computer averaging. This averaging process reveals a characteristic sequence of positive- and negative-going waves evoked by the stimulus

presentations. These wave profiles vary uniquely from one modality to another (e.g., visual evoked potentials vs. auditory evoked potentials); in addition, various positive and negative components of the average evoked potential are sensitive to a variety of conditions, including stimulus parameters, maturations, states of consciousness, levels of vigilance, expectancy, effort, and the like (Donchin and Lindsley, 1969).

Preston, Guthrie, and Childs (1974) reported that a late component (at about 200Msec) of the visual evoked potential (VEP) was smaller in disabled readers than in controls. Will these results replicate? If so, what do they mean? There are several possible reasons for these results.

1. The poor readers, possibly less motivated than the controls, failed to sustain attention throughout the period of the averaging process.

2. The poor readers, possibly less motivated, became drowsy.

3. For poor readers, the variability of the latency of this late component is higher than for controls.

4. Visual information processing -- and therefore neural mediation -- is impaired in reading-disabled children.

Information bearing on any of these possibilities would provide a possibility of much more refined diagnoses of the differences in functioning between normal and disabled readers.

Project Research Considerations

There are a number of ways to examine and eliminate some of the possibilities mentioned above.

1. Measure evoked potentials to simple stimuli from three modalities: visual, auditory, and somatosensory. Reduced late components in all three would rule out specific impairment of visual processing mechanisms.

2. Convert the VEP task of Preston et al. (1974) to a vigilance task in which the subjects would be rewarded with a payoff for detecting the stimuli. Under these conditions, if the disabled readers show shifts in the late components of the VEP toward the pattern characteristic of normal readers, then motivational and attentional explanations of the findings become more plausible.

3. Examine the variability of peak latency in the VEP. If the reduced amplitude of late components is the result of

variability in the timing of sensory-cortical information volleys, then the reading-disabled child may have a basic sensory-neural deficiency.

4. Evoked potentials generated by simple visual stimuli are largest on the occipital scalp. However, they are usually also detected over visual "association" areas, at the vertex, and even over auditory receiving areas. Bernard Saltzburg at Tulane has reported in a personal communication to us that in a small group of learning-disabled children, the visual evoked potential showed normal amplitudes at occipital leads, but was undetectable in other scalp areas. The reduced late component in the VEP reported by Preston et al. (1974) was obtained with leads located over the angular gyrus of the parietal lobe, not over the occipital receiving areas. If we can confirm both these sets of findings, then the possibility arises that reading-disabled children may not differ from normal readers in strictly visual information-processing mechanisms, but that they encounter major difficulties in intersensory transcortical transmissions.

5. A most interesting feature of both acoustically and visually generated evoked potentials is the very late positive event variously labeled P_3, P_{300}, or the late positive wave, which clearly contains information about aspects of information processing (Sutton et al., 1965). Apparently P_{300} is potentiated in signal detection situations by certain psychological variables involving expectancy, uncertainty, surprise, and complexity. It may be informative, therefore, to examine EEG and evoked responses during ongoing performance of reading-disabled children in order to determine if the observed differences in evoked potential components between normal and reading-disabled children arise primarily from differences in neural information-processing mechanisms or from differences attributable to motivational and attentional variables.

Project 3.1.1.6: Reaction Time Performance.

Project Statement

Compare the reaction time (RT) performances of normal and reading-disabled children.

Project Potential

Because it is commonly noted that many reading-disabled children fail to sustain attention, it seems worthwhile to investigate their attentional performance on laboratory tasks measuring reaction times. Laboratory studies should allow for a more careful analysis of the

nature of the children's attentional problems, resulting in a more refined idea of the nature of the difficulty, as well as a more controlled examination of the conditions which elicit or inhibit attention.

Project Research Considerations

If differences in reaction times are found between normal and disabled readers, then it will be important to examine the exact nature of the differences, with particular attention to the shapes of the distributions of RTs for the two groups. For example, if slowing of RT is found in disabled readers, is this slowing best represented by a change in central tendency of the distribution of RTs (i.e. the median) or by an increase in skew? The latter parameter is most sensitive to drowsy states whereas the median is probably more representative for certain drug states and brain damage. Increased skew would appear when delayed responses occur sporadically in the presence of otherwise good performance (Williams et al., 1959). These intermittent "lapses" can result from momentary loss of concentration, interference by internal or external states, sporadic periods of drowsiness, and the like. A change in central tendency (median) with no increase in skew would suggest some fundamental deficit in CNS (central nervous system) functioning.

Project 3.1.1.7: Relation of EEG Spectrum to Slowing of Reaction Times.

Project Statement

Investigate any systematic alterations in EEG spectrum which may be associated with slowing of reaction times in reading-disabled children.

Project Potential

Several investigations show that delayed responses in reaction time tasks and errors of omission in vigilance tasks are often associated with prior slowing or disappearance of the alpha rhythm in the EEG (Williams et al., 1962; Surwillo, 1963). Using spectral analysis, Janice Stevens at Oregon found that in normal adults and children, long reaction times and errors of omission on an auditory recognition task were preceded by systematic slowing of EEG frequencies. Adult schizophrenics and epileptics who also produced delayed responses and errors of omission also showed systematic changes in the EEG spectral profile just before presentation of the stimulus. However, in these cases the altered spectral profiles were qualitatively different between the two groups, as well as being qualitatively different from those found in normal subjects (Stevens et al., 1972).

Project Research Considerations

Specifically, if there are found to be alterations in the EEG spectrums of reading-disabled children which may be associated with slower RTs, do the altered spectra show: (a) slowing of wave forms, (b) the "ramp" pattern found in Stevens' epileptics, or possibly (c) the "noise" pattern found in Stevens' schizophrenics?

Project 3.1.1.8: Making Reaction Time Distributions Normal.

Project Statement

Investigate the possibility that the RT distributions of reading-disabled children can be made normal by instruction, feedback, penalties, or rewards.

Project Potential

A finding that the RT performance of reading-disabled children could be made normal by one or another incentive variables would suggest that their attentional problems in school are not the result of a basic defect in their attentional mechanisms.

Project Research Considerations

Garmezy's group found that the RT distributions of "externalizing" children (a subgroup of the hyperactive syndrome) whose RT performance showed high positive skew could be made normal by converting the task to a game in which there was a financial payoff for fast responding. Children of schizophrenic mothers, on the other hand, whose RT distributions showed an increase in central tendency but not in skew, were not brought to normal performance by this procedure (Marcus, 1972; Garmezy, 1974).

Project 3.1.1.9: Psychophysiological Changes as Determinants of Reaction Time.

Project Statement

Compare normal and disabled readers for differences in psychophysiological patterns in the state just preceding RT experiment responses.

Project Potential

Assuming that under neutral task conditions the reading-disabled child demonstrates slowed RTs it may be useful to examine psychophysiological patterns in the state just preceding fast and slow responses. A finding that reading-disabled children differ from

controls in preparatory set for some tasks would indicate that factors present before the onset of performance are important determinants of RT. Subsequent studies attempting to manipulate these variables may be conducted. If the preparatory set variables can be altered by feedback, reward, or other incentives, then it would be possible to determine whether differences in RT are the results of these preparatory conditions or of later processing mechanisms.

Project Research Considerations

Lacey (1967), Obrist (1970), Sroufe (1973), and others found that in the preparatory interval of simple reaction-time tasks, both normal children and adults show a characteristic physiological pattern consisting of reduced heart rate, reduced body movement, and EMG activity accompanied by increased skin conductance. Generally, in both normal adults and children, reaction time is significantly correlated with the magnitude of these changes. Of the several physiological variables, magnitude of heart rate deceleration seems to be the best predictor of RT. These psychophysiological changes appear to represent a state of readiness to respond, a state of focused attention in which irrelevant motor activity is momentarily inhibited.

What does this complex pattern look like in reading-disabled children? Sroufe (1973) reported that, in a group of learning disability children, the correlation between heart rate deceleration and RT was zero. This finding may have been related to the fact that the average magnitude of heart rate change during the preparatory interval was less than in controls. Sroufe also reported that Ritalin medication produced an increase in correlation between RT and heart rate change, to a level approximating that found in normal children. Sroufe made no attempt in those studies to make the relationship between heart rate and RT normal, by using psychological treatments such as feedback or incentive. Along this same line, Parsons and his colleagues found in brain-injured adults, a reversal of the normal relationship between heart rate change and RT (Holloway and Parsons, 1972). That is, for brain-damaged patients, the greater the heart rate deceleration during the preparatory interval, the slower the RT. It was as if the presence of the physiological preparatory behaviors interfered with processing and responding to the signal.

The organization of both autonomic and skeletal variables into the complex pattern of changes found in the preparatory interval must require rather high level CNS management. It would be interesting, therefore, to examine these RT-physiological patterns in reading-disabled children with and without incentive operations.

Project 3.1.1.10: Visual Information Processing in Reading-Disabled Children.

Project Statement

Investigate and seek to identify which component process(es) or stage(s) of visual information processing is impaired in reading-disabled children.

Project Potential

During the past decade several models have been proposed that represent the reading process as consisting of a number of (more or less) discrete elements or systems (Davis, 1971; Singer and Ruddell, 1970). While many of these models are not attempts at comprehensive descriptions of the reading process, the simplicity with which they allow one to conceptualize the nature of reading, as well as the usefulness of the tasks derived from such models, have proved valuable in the analysis of components of the reading process.

Several current models of information processing either are incorporated into or are comparable with some of the more recent of these reading models (Mackworth, 1971, and Geyer, 1970, give a review of current reading models). These models of information processing assume a sequence of cognitive stages such as (a) stimulus preprocessing, followed by (b) stimulus categorization, followed by (c) response selection and (d) response execution. In character recognition tasks, with RT as dependent variable, such models assume that we can decompose total RT into additive segments corresponding to these hypothesized discrete stages. (Smith, 1968, gives a review of these and other RT models.) If discrete, nonoverlapping, sequential stages are involved in character recognition, then it might be possible to identify psychological treatments that influence, specifically, one but not another of these stages. It may be useful to examine patterns of additivity and interaction between reading disability, as an experimental factor, and previously established experimental variables in an attempt to get a better fix on which processing operations or stages (if any) are differentially vulnerable in reading-disabled children. Presumably we could improve the quality of intervention (reading therapy) if we knew that the children were having problems with input (say) rather than cognitive transformations or output. Thus, if the "decoding" difficulty of reading-disabled children represents a problem of processing input (i.e., perception) then intervention should probably include such operations as enhancing figure-ground definition, increasing signal to noise ratios, regularizing the environment, and reducing background noise. Suppose that the "decoding" difficulty is on the output side, as it is in inebriated states (Tharp et al., in press). Then one would hope to devise intervention techniques to sustain the cognitive operations involved in the selection and organization of responses. Experimental

tests might reveal that optimal intervention for the latter case is not identical for that in the case of perceptual impairment.

Project Research Considerations

Several investigators have been able to show that separate stages of the information model are susceptible to different experimental manipulations. In general, rationally selected experimental treatments that influence separate stages in the model should have additive effects on RT, whereas the effects of treatment that influence the same stage of information processing should show strong statistical interactions.

Sternberg and others have identified experimental variables that behave in the expected way. For example, treatments that alter the discriminability of the stimulus have additive effects with treatments that alter the difficulty of selecting the response. In general, the former variables appear to influence the stimulus preprocessing stage whereas the latter probably influence the cognitive operations involved in response selection.

Now suppose that one identifies a new condition which causes impairment of performance. Obviously a condition such as a drug, or brain damage, or psychopathology, or time of day, or possibly reading disability, could be associated with deficit in one or two or all of the stages of the model. We suggest that by examining the patterns of additivity and interaction between effects of the new treatment or condition and those of already established experimental variables, one may be able to identify which processing stage or stages are vulnerable to the new condition. For example, there is recent evidence that alcohol differentially impairs both stimulus preprocessing and response selection operations, but not stimulus categorization. These facts are true, apparently, despite the fact that alcohol and the barbiturates are usually classified together as narcotics and general depressants (Tharp et al., in press).

Project 3.1.1.11: Memory.

Project Statement

Compare the performances of normal and reading-disabled children on verbal free recall tasks for evidence of differential memorial deficit.

Project Potential

Studies by Glanzer and his colleagues (1971), by Atkinson and Shiffrin (1968), and by several others, recommend a model for verbal memory which is rather similar to that espoused by Sternberg and others for character-recognition tasks. That is, after an item is

encoded, it enters a limited capacity, short term store; then it is transferred to a long term store, the former having continuous access to the latter.

A finding of memorial deficit (or its absence) in reading-disabled children would, of course, be interesting. However, a convincing demonstration that the deficit was located specifically in the short or long term store could lead to more specific methods of intervention. Such a finding would suggest subsequent studies directed toward more precise specification of the vulnerable memorial operations or stages in the reading-disabled child.

Project Research Considerations

Both theoretical and empirical considerations suggest that in verbal free recall tasks the several items most recently presented are stored in short term memory, while the earlier items must be stored in long term memory. Thus, performance in recalling the most recent items on the list will serve as an index of the short term register, whereas the performance in recalling the remaining (earlier) item indexes the status of the long term store. The free recall technique, then, helps to differentiate the effects of short term and long term memory.

Most traditional psychological treatments in verbal learning research such as list length, item difficulty, rate of presentation, item associative strengths and forced rehearsal show statistical interactions with the serial position effect. That is, those treatments influence the first two-thirds of the serial position function, the portion of the function which is identified theoretically with the long term store. Only a few experimental variables affect the "recency" portion of the function, the putative short term store. The most powerful of these is "displacement." One way to produce "displacement" from short term store is to use a delayed-recall paradigm where delay interval is filled with an interpolated task. The latter treatment erases the recency portion of the serial position function but has no effect on the primacy or central parts of the function.

The results Glanzer and other investigators achieved imply that the capacity of the short term store is somewhat smaller than the "seven plus or minus two" proposed by George Miller. Their data are consonant, however, with Miller's view that the items are chunklike rather than bitlike in character. Thus, Glanzer (1971) found evidence that the short term store can contain a maximum of either two to four words, or two to four well-formed and familiar sentences.

Suppose we identify a new condition such as a drug, brain injury, psychopathology, age, or reading disability which causes a deficit in verbal free recall. Is the principal deficit located in short term or long term storage or both? Perhaps analysis of the patterns of

additivity and interaction between the new condition and established treatments will reveal something about vulnerable memorial processes in learning-disabled children.

Recent unpublished studies of drug effects on free recall by H. L. Williams and colleagues have, in fact, been useful in this regard. For example, alcohol impairs the long term store, probably by altering the subject's strategy for structuring semantic information in such a way that normal retrieval operations are not successful.

Program 3.1.2: Within-Child Variations in Performance and Engagement

Program Potential

The schedule of the school day invokes regularized shifts in the behavioral constraints placed on children. Any attempts at cataloguing behavior over the course of a school day would have to take into account the shifts in behavioral expectations which occur when the class as a whole moves from one set of activities to another; for example, from reading to recess. Looked at in this way, the school day is organized into alternating periods of rest and activity.

Natural cycles of activity level and performance are known to exist in a number of areas of adult behavior, with performance on such tasks as reaction time, vigilance, and time estimation showing regular variations over the course of a day. The extent to which these (or other) fluctuations in performance may be found in young children remains relatively unknown, though there are reasons to suspect that the effect of biological rhythms on performance may be even more pronounced in children than in adults.

Several projects to investigate variations on electrophysiological measures which may serve as indices of basic attentional levels have been outlined in Program 3.1.1. The present program is concerned with observable behavioral manifestations of endogenous factors -- stemming from within children -- which help to determine the observable level of performance.

The careful assessment of regular cycles in performance, and an estimate of their impact on school-related tasks, could have important implications for scheduling school activities. A finding that individual children (or identifiable subgroups, such as those with learning problems) show cycles of performance which are not in phase with the cycles of their classmates could help to explain some of the observed within-child variations in performance efficiency shown by some children now categorized as learning disabled.

Program Research Considerations

There is a need to extend the work on the rhythms of adult performance to that of children in the early years of school. Kleitman (1963), Colquhoun (1971), Blake (1971), and others have investigated time-of-day effects in adult performances on such tasks as time estimation, speed and accuracy in arithmetic, speed and accuracy of card sorting, vigilance, reaction time, reading rate, and other tasks. In general, tasks which seem to have less cognitive complexity for adults seem to be more susceptible to the time-of-day phenomenon. It is likely that similar effects would be found with school children, and it would be important to note whether performances on certain reading or arithmetic tasks, presumably containing a good deal of cognitive complexity for school-age children, also show significant variations with the time of day. In addition, it would be important to include several behavioral measures of attention in order to determine whether there are regular observable fluctuations we should take into account in analyzing classroom performances.

Project 3.1.2.1: Rhythms and Periodicities in Children's Engagement.

Project Statement

Conduct classroom observations designed to assess the rhythms and periodicities in children's engagement in reading-related activities.

Project Potential

It is clear that there is an ongoing interaction between the child's natural biological rhythms and the behavioral constraints imposed by the classroom situation. While a long range goal would be to separate the effects of those factors, this project is concerned with the establishment of data which would show how engagement in reading activities is distributed over the course of the school day. While it would seem obvious that the peaks in reading engagement would coincide with the scheduled periods for reading instruction, it is possible that there would also be regular fluctuations within and between these periods. It is at least a possibility that relatively high occurrences of reading engagement may be observed during unexpected times of the school day. (Note: The development of a methodology for measuring attention with observational techniques is considered later, in Program 3.1.3.)

Project Research Considerations

Of particular interest in this project would be information on both within-classroom and between-classroom variations in the distribution of reading related activities over time. If different

classrooms (matched on other important variables) show different time distributions of engagement behavior, and there is considerable homogeneity within each classroom, this discrepancy would be evidence that the influence of the "school schedule" may overwhelm the effects of naturally occurring engagement rhythms in the children. On the other hand, should we find that there is a tendency for periods of high engagement behavior to move toward coincidence in time-of-day from one classroom to another despite different external schedules, then we would have evidence for the influence of natural rhythms not dominated by external factors.

It is also possible that there would be (at a single grade level) considerable homogeneity both within and between classrooms in the distributions of engagement behavior. This homogeneity would be evidence for the "entrainment" of the two rhythms: either (a) the children's engagement rhythms adjust to coincide with the rhythm imposed by the school schedule, or (b) classroom schedules may well be determined as a result of intuitive teacher judgments as to the optimal times to schedule work and rest periods so as to make the best use of the children's natural cycles. These two possibilities may be resolved by analyses of cross-age trends in both natural and school-imposed rhythms of engagements. If within-classroom heterogeneity exists in grade one, and gives way to gradually increasing homogeneity in later grades, then it would seem that there is some plasticity in natural performance rhythm, and thus that most children gradually adjust to culturally imposed work-rest schedules.

Project 3.1.2.2: Natural Cycles of Children's Performance.

Project Statement

Investigate the natural cycles of children's performance on experimental tasks.

Project Potential

While there have been many studies investigating performance cycles in adults (Kleitman, 1963; Colquhoun, 1971), there have been few studies investigating such phenomena in children. There seems to exist a general relationship between daily variations in performance and the daily body temperature cycle, with maximum efficiency, on such tasks as reaction time and vigilance, reached at periods of maximum body temperature. Kleitman and others have also suggested that there may be shorter period (ultradian) cycles in performance, perhaps related in some way to the well-known cycles (90 to 100 minutes) in the stages of sleep in adults.

If rhythmic variations in performance are related to the sleep cycle and/or the temperature cycle, then we would expect cycles to

exist in children as well as adults, since children are known to differ from adults in their cycles of sleep and body temperature.

This project would involve the systematic investigation of children's performance at varying times during the school day. In addition to measures of reaction time, vigilance, etc., measures of reading and arithmetic skills would be of particular interest. For example, we could give children tasks at hourly intervals, and then analyze measures of both speed and accuracy for evidence of daily cyclicity.

Project Research Considerations

We should assess the covariation of these cycles with measures of engagement behavior cycles (see Project 3.1.2.1). This investigation may provide evidence suggesting a relationship between engagement and performance.

Project 3.1.2.3: Variation in Individual Engagement Cycles (1).

Project Statement

Investigate the variation in individual engagement cycles when classroom activities are teacher-directed as against those freely chosen by the children.

Project Potential

This project is concerned with the examination of two central issues: (a) Are the fluctuations in engagement behavior in teacher-directed situations principally influenced by teacher behavior, or are they independent of teacher activity? Teacher behavior may be considered, in some sense, as an external factor influencing student engagement. Thus, the observational methods suggested in Program 3.1.3 may be appropriate for this analysis. (b) During periods when students are free to choose activities, periodic fluctuations in engagement behavior may more closely approximate naturally occurring rhythms. If, under these conditions, we identify natural cycles, we may analyze the synchronization of these cycles and externally imposed schedules.

Project 3.1.2.4: Variation in Individual Engagement Cycles (2).

Project Statement

Investigate the variation in individual engagement cycles over the course of the school day in skilled and unskilled readers.

Project Potential

Because successful reading performance requires engagement, one might expect that engagement cycles are related to reading ability. There may be daily cycles more conducive to learning to read in a classroom setting. A number of children now diagnosed as reading-disabled may be operating on cycles in conflict with the demands of the school schedule.

Project 3.1.2.5: Variation in Individual Engagement Cycles (3).

Project Statement

Investigate the variation in individual engagement cycles during limited units of time within the school day in skilled and unskilled readers.

Project Potential

In addition to daily engagement cycles, there may also be fluctuations in individual engagement over shorter periods of time. For instance, during a particular reading lesson, not only would total student engagement times differ, but it is possible that particular patterns of engagement may characterize high engagers, while a different set of patterns may typify low engagers. One pattern may be an extended period of engagement, broken only by brief periods of distraction; another pattern may consist of roughly equal alternating periods of engagement and distraction. There would be at least two implications of such findings: (a) teachers could attempt to adjust their instructional strategies to coincide with individual engagement patterns, or (b) teachers could attempt to induce changes in the patterns characteristic of low engagers.

Program 3.1.3: External Influences on Engagement in Reading.

Program Statement

Investigate individual engagement in reading-related tasks under varying degrees of external load.

Program Potential

There are a number of environmental influences, labeled "external load factors," which affect the child's engagement in school-related tasks.

By external load we refer to factors that detract from the full employment of the cognitive structure available to the individual. These would be, generally, (a) the presence of environmental noisiness,

in the instructions or the environs of the task, requiring signal processing; (b) the presence of task properties which may be unfamiliar or distracting, and (c) the presence of multiple agenda in the task situation, circumstances that require children to "time-share" their behavior, at times adjusting to cognitive, social, or mood-tension activities.

There exist few investigations which have examined systematically the effects of load on student performance. Most studies in this area have focused on isolated variables, and have also been conducted in settings which have been artificially abstracted from real-time behavior in classrooms. If such studies are to add to our understanding of the engagement process in the classroom, they should examine the effects of these load factors on the engagement behavior of children in naturalistic settings.

Program Research Considerations

During the late 1950's and 1960's linguists and psycholinguists strove toward competence theories of the organism and its behavior. Although this attempt was heuristically useful, its utility is decreasing for our understanding of children's real-world behavior. One can no longer speak in terms of a pure "capacity" model, insofar as certain factors -- called "load" -- interact with this "capacity" to produce observable performance or behavior. Thus, under conditions of no or low load, 4-year-olds may show conservation while even 8- or 9-year-olds may not solve the same task under conditions of high load (Gelman, 1969). In a similar vein, we can argue that cognitive development is both the development of cognitive abilities and the development of devices to handle "load" factors.

There exists a vast literature concerning the effects of testing format on performance. These studies span many aspects of cognitive ability. The effect of load factors on problem solving, particularly on Piagetian tasks, has been extensively studied (Gelman, 1969; Feldman et al., 1974; Price-Williams et al., 1969). There have been similar studies on performance-competence in perception, memory, language, and attention. There is a need to evaluate this literature systematically in order to arrive at an orderly understanding of load factors.

Observational research avoids some of the problems of structured testing situations; psychologists and anthropologists have recently developed useful methods for studying behavior in naturalistic settings (LeVine, 1970).

Structured and naturalistic studies are incorporated in the projects that follow. The studies are designed to investigate systematically the effects of load factors on student engagement in classroom settings.

Project 3.1.3.1: Review of Literature on Effect of Load Factors on Classroom Engagement.

Project Statement

Conduct a systematic review of the literature concerning the effect of load factors on classroom engagement.

Project Potential

A systematic search of the widely diversified literature on children's attention presumably would yield a number of possibly isolable factors influencing attention. This search would be an attempt to synthesize the existing literature into a limited set of variables relevant to the classroom setting, in particular, to reading-related tasks. Such a search would require a significant effort, but it would be an obvious precursor to a research program on load. It would also be of some immediate value for educators.

Project Research Considerations

As a starting point, it may be useful to consider earlier attempts at isolating variables influencing student achievement (Stephens, 1967). In addition, one should understand that a literature search would not necessarily produce an exhaustive list of load factors. Other sources may include teacher observations and ongoing research efforts.

A full list of external load factors would consider the following:

1. Multiple Agenda. There seem to be several purposes -- cognitive, social and personal -- that influence children's classroom behavior (Pierson, 1970). Activities related to these purposes may at times conflict with the goals of the teacher. Thus, engagement in classroom activities may be influenced by the conflicting purposes directing children's behavior.

2. Stimulus Variables. Certain properties (such as organization of familiarity) of the materials with which children interact may affect their task performance.

3. Noise Factors. This category includes the many environmental distractions, such as background noise level, that may affect student performance. In addition, children's degree of

familiarity with classroom procedures should be considered in this context.

Project 3.1.3.2: Identification of Extrinsic Factors Associated with Engagement.

Project Statement

Examining individual children in classrooms, attempt to identify inductively extrinsic factors associated with instances of entering and exiting engagement in reading-related activities.

Project Potential

This investigation would be similar to some of the careful behavior modification work, which makes extended study of emitted behaviors in order to identify stimulus-response-reinforcement contingencies. But the intent of this study would be quite different. The effort here would be to attempt to identify inductively: (a) children who are relatively labile, able to be influenced by environmental load factors, and children who are less labile; and (b) the extrinsic load factors in operation in classrooms, their relative frequency and controlability, and their uniform or diverse influence on individual children.

The intent of this research would be exploratory and would look like a series of case studies rather than a comprehensive design. This format would allow for flexibility in data collection and would not limit the study to extensive investigation of predetermined categories of load factors. It may be possible to determine if there is real consistency among children or if the load factor-engagement interactions are idiosyncratic. For example, one might expect that low engagement individuals would be susceptible to a variety of load factors, but within this group there may exist individual differences in susceptibility to the various factors. Such an investigation might provide the beginnings of a theory of competence-performance trade-offs as a function of load factors.

Project 3.1.3.3: Developmental Changes in Effects of Load Factors on Engagement.

Project Statement

Conduct semilongitudinal investigations of the differential effects of identifiable load factors on the engagement of individual children.

Project Potential

This project is designed to look at developmental changes in the load factor-engagement interactions of individual children. We may find consistent trends in susceptibility to load factors and individual engagement. We suspect that susceptibility decreases with age and that engagement increases. There may also be phasic perturbations within this overall trend as well as "special period" effects (e.g., upon entry into puberty). A reasonable design for this research would be the selection of first-, third-, and fifth-grade cohorts to be followed for a three-year period. Data would be collected in a manner similar to that outlined in Project 3.1.3.2. We hope this procedure would outline significant developmental trends.

Project 3.1.3.4: Analysis of Factors Influencing Sustained Engagement.

Project Statement

Study those factors which make possible sustained engagement in reading-related activities.

Project Potential

Project 3.1.3.2 attempted to identify factors associated with instances of entering and exiting in reading-related activities. It is possible that in freely chosen reading activities some children may characteristically display short intervals between entering and exiting. Such children may become initially interested in reading material, yet may not demonstrate sustained engagement in reading. Furthermore, it is possible that such behavior is not a matter of individual choice but rather is a result of one or more factors, including (a) reading ability, (b) ability to assess the readability level of the materials, and (c) ability to identify materials of high interest. Other factors influencing the entry-exit patterns may be environmental distractions and conflicting cognitive, social, and/or personal agenda of the child.

If poor reading ability characterizes most of those children who display very little sustained engagement, then it would seem that improvement in reading should precede direct attempts to change the children's engagement patterns. If these children are unable accurately to judge the readability level of reading materials, if they cannot consistently select materials appropriate to their level of reading skill, then special efforts should be made to instruct them in assessing readability. We hope these efforts would serve to overcome the frustration that these children may feel in continually encountering materials which are too easy or too difficult. If these children are not easily able to select materials of high

interest, then special consideration should be given to (a) helping them become explicitly aware of their own interests and (b) assisting them in selecting materials appropriate to these interests.

Project 3.1.3.5: Effect of Rhythmic and Ritualistic Organizers on Performance.

Project Statement

Conduct developmental studies of the effects of rhythmic and ritualistic organizers on performance on experimental tasks.

Project Potential

Rhythm and ritual are commonly used by teachers in classrooms. For instance, children may learn rhymes in order to remember spelling rules (a use of rhythm); and teacher instructions may often follow a general, stereotypic format (a use of ritual). There is some reason to suspect that rhythm and ritual may be important organizers influencing children's performance in a variety of situations. Children show some affinity for ritualized or rhythmic activities. Piaget (1962) reports that the use of rhythm is an important substrate of the activities (such as drawing) of very young children. Neisser (1967) suggests that certain rhythmic properties of stimulus materials may be important organizers of memory for adults.

It would be important to study the effects of using such organizers on performance across age levels. For young children with short attention spans, these organizers may help to sustain attention to a task over time. Rituals may serve to define what behaviors are relevant. Rituals may serve as a mnemonic, a recurring pattern of sameness to which a series of novelties may be assimilated. Rhythm may serve to organize the unfolding of a pattern of behaviors over time.

Experimental studies should be designed to investigate the effects of rhythmic and arhythmic (and ritualistic and aritualistic) procedures on performance (e.g., in giving task instructions, in the presentation of test items, etc.). This relationship should be examined with respect to a number of variables, such as (a) complexity of the tasks presented, (b) age, (c) presence of varying amounts of load (noise). These investigations would identify the magnitude and range of the effectiveness of rhythm and ritual in increasing children's performances on experimental tasks, and would suggest classroom conditions within which rhythm and ritual may be optimally effective.

Project 3.1.3.6: Use of Rhythm and Ritual in Classrooms.

Project Statement

Conduct investigations of the use of rhythm and ritual in classrooms.

Project Potential

It may be useful to examine different approaches to classroom instruction with respect to varying uses of rhythm and ritual as organizers of behavior. This investigation may be conducted at two levels: (a) comparing the uses of rhythm and ritual in different classroom instructional programs (e.g., behavior modification, traditional-structured, open-unstructured), and (b) comparing specific curriculum methods within a particular set of classroom programs (e.g., different reading curriculums, such as Cureton's method, 1973, and the SRA reading series, 1970).

"Structure" is an important term in discussions of teaching approaches, but one without a universally agreed-upon definition. One defining attribute of structured approaches to teaching may be the marked use of rhythmic or ritualistic organizations of classroom work. Analyses of classroom observations may demonstrate that the salient differences among classrooms (or programs) may be principally explained in terms of differing uses of rhythm and ritual.

Program 3.1.4: Self-Perception and Engagement in Reading.

Program Statement

Study the relationship between children's conceptions of their cognitive abilities and their roles in the schooling process, and their engagement behavior in the classroom.

Program Potential

There has been increasing theoretical and empirical interest in children's conceptions of themselves as knowers and learners, and their acquisition of learning heuristics and process notions. Thus, there has been much recent discussion of "metacognitive" and "metalinguistic" knowledge. Can children take their thoughts or their language as objects and discuss them?

This work develops a facet of Piagetian theory that was left behind in the first wave of acceptance of genetic epistemology. It is central to Piagetian theory that structured knowledge about acts or operations must develop at roughly the same pace as structured knowledge about the external world. In his early work, Piaget developed the concept of a decline of egocentrism in the late preschool years.

Through conversations with others, children gradually come to know that some parts of what they know are known by everyone and other parts are private. Their thought becomes "socialized." They distinguish between what they know and what everyone knows. There is a decline of egocentrism at each point of cognitive development; all cognitive development involves the differentiation of the act from the acted upon; to form a notion of one is to clarify somewhat the extent of the other (Flavell, 1963).

As children develop notions of the nature and scope of their own activity they attempt to speculate not only about the world around them but about themselves and their roles in what they experience.

Because schooling is a major aspect of children's experience, one would expect that they have a conception of what part they play (and should play) in this system. Further, it is likely that these self-perceptions influence children's classroom behavior.

The investigation of the relationship between children's self concepts and their engagement behavior in the classroom should lead to other important questions. If such a relationship is established, it would be valuable to investigate whether particular facets of classroom structure seem to be regularly associated with certain student attitudes (e.g. the unstructured classroom may be more likely to promote self-confidence than the highly structured classroom). The practical implications for attentional management in the classroom are obvious: if student self-perceptions with respect to schooling are related to classroom engagement behavior, then teachers must attempt to create an environment which promotes the development of healthy self-perceptions.

Program Research Considerations

The research proposed in this program requires methodological tools for evaluating children's self-perceptions about the schooling process. We may attempt to assess children's self-assessment in relatively particular or general ways. To arrive at particulars, one might ask the children to estimate their competence at different kinds of work samples, to describe the tactics or strategies they would use to approach tasks outlined for them, or conceivably, to contrast the approach they would take to a task as against someone else's. To arrive at more general self-assessments, we might ask the children to rank-order themselves against other children with regard to smaller or larger classes of performance, or we might use any of a variety of techniques traditionally directed at personality assessment.

Project 3.1.4.1: Children's Self-Perceptions and Engagement Behavior.

Project Statement

Investigate the relationship between children's self-perceptions of their reading ability and their engagement behavior in reading-related activities.

Project Potential

This project will investigate the effect of children's conceptions of their own reading abilities on their engagement behavior. It is not clear that there should be a direct relationship between children's perception of their own abilities and their actual performance in reading. For example, children who express low self-perception with respect to reading may actually perform well in reading relative to their peers. This project focuses on the relationship of children's expressions of their reading abilities (low to high) and their engagement in reading-related tasks. We might evaluate self-perceptions using the techniques outlined above and might compare these perceptions with engagement in the classroom.

Project 3.1.4.2: Children's Perception of Reading Instruction.

Project Statement

Study children's perception of the purpose of reading instruction at different stages of reading development.

Project Potential

The central notion addressed here is that children who understand the purpose of an instructional sequence will have an important initial motivation for attending to the instructions and for practicing. This project should be carried out with children at different levels of reading development. As in the preceding project, we would use various techniques to assess the children's awareness of the outcomes of various reading lessons. The degree to which children are cognizant of the goals and issues in an instructional unit would be related to their degree of engagement in this unit. A finding that a significant relationship exists between children's perception of the purpose of reading instruction and their engagement behavior would suggest that attempts to stimulate greater attention in children should consider their awareness of the broader goals of the lesson. One might expect that developmental trends in this relationship would occur; it is likely that children develop increasingly complex ideas about reading and reading instruction as they grow older. However, it is possible that the degree of awareness of instructional goals would differentiate between skilled and unskilled readers at each grade level.

Project 3.1.4.3: Children's Intuition.

Project Statement

Investigate children's intuitions about what types of reading materials and procedures elicit and maintain their engagement.

Project Potential

This project is designed to investigate the idea that children's statements about what factors are important in stimulating their engagement are accurate indices of what factors really stimulate their engagement. Two questions of central importance arising from this line of research would be: (a) whether children's intuitions regarding what factors elicit and/or maintain their engagement can be helpful in selecting materials and procedures for reading instruction, and (b) whether the accuracy of these intuitions is related to skill in reading. One might expect that better readers would show greater awareness of the factors important in eliciting and maintaining their attention, whereas poor readers may show little awareness of these factors. A finding that children's statements may be accurate indices of what really interests them would suggest that children's intuitions may be useful in planning reading instruction. If the accuracy of children's statements is found to be related to reading skill, then attempts to stimulate engagement should consider the children's degree of awareness of what types of materials and/or procedures will be most successful in this regard.

Project 3.1.4.4: Children's Awareness of Reading Strengths and Weaknesses.

Project Statement

Investigate children's awareness of their strengths and weaknesses in various subskills involved in reading.

Project Potential

Learning to read involves the mastery of a number of components, including the processing of visual, auditory, and linguistic information. The teaching of beginning reading often assumes that some of these components may be treated as separate skills. Further, children differ in their proficiency with respect to these various subskills. This project would investigate children's awareness of their strengths and weaknesses in these subskills, and whether the children's degree of awareness is related to their engagement behavior in reading-related tasks. Children who say that they are deficient in a particular subskill (e.g. blending) may show greater engagement in activities designed to teach this skill; or it is also possible that children might avoid engagement in activities directed

toward their weaknesses. Some programs (e.g. the Gillingham-Orton method) make explicit to children their areas of strength or weakness, and attempt to make them aware of the goals of particular reading lessons. This research would provide information on the effects that such awareness has on engagement in tasks related to various reading subskills.

APPROACH 3.2

RESEARCH ON TEACHER-STUDENT INTERACTION

Approach Statement

Study the relationship between teacher-student interactions and student engagement in the classroom.

Approach Potential

Approach 3.1 focused on the student and certain characteristics of the student that might be favorable or unfavorable for classroom engagement. In this section we consider studies of classroom process.

Teacher behavior in the classroom may be considered as an external load factor influencing student engagement. However, teachers influence the students not only directly, but through their manipulation of a variety of environmental factors affecting student engagement. According to Hess (1974): "Differences among teachers account for the greatest proportion of variability in student engagement." Further, he argues that both teachers' global strategies and their specific classroom teaching techniques are related to engagement.

We suggest here only one program of research on classroom processes. Other planning activities of the NIE have focused extensively on the analysis of teaching and teacher-student interactions (see in particular the ten-panel series of reports from the NIE Conference on Research on Teaching). The particular focus we suggest is descriptive -- we are concerned with the way in which teacher behaviors, classroom activities, and the content of reading instruction relate to student engagement.

Program 3.2.1: Conditions Promoting Student Engagement in the Classroom.

Program Statement

This program seeks to relate patterns of student-teacher interaction, teacher behaviors, and classroom activities to student engagement in reading.

Program Potential

Both attentional management and motivational management of students are critical to the successful teaching of reading. As

instructional strategies become more diverse through the adoption of various models of classroom organization, teaching styles, and approaches to the teaching of reading, the variation in the ways that teachers orchestrate the flow of activities and information within classrooms increases. Descriptive data portraying the successful and unsuccessful attempts of teachers to promote engagement in different settings should provide: (a) hypotheses for future experimental interventions in the classroom, and (b) insight into the theory and nature of individual processes that control engagement.

Program Research Considerations

A concern with describing the nature of engagement in classrooms assumes that we have adequate instruments to assess whether or not a student is engaged. Preliminary work in this area has been somewhat successful (Pierson, 1970), but more work needs to be done. This type of work is expensive, because it requires considerable observation -- as a consequence, activities should be as directed as possible. We recommend the use of narrow band ("hypothesis-testing") observational instruments wherever possible.

Division of Program into Projects

We suggest five projects. The first calls for an overall accounting of the amount of time and variation in time that teachers spend in engagement management and in direct instructional activities. This accounting should give us a base on which to assess the data generated from the other four projects. These in turn call for analysis of the consequences for student engagement of variations in settings, teacher behaviors, classroom activities, and the timing and pacing of teacher behaviors.

Project 3.2.1.1: Time Spent in Instruction and Engagement Management.

Project Statement

Compare the amount of time teachers spend actually instructing children in reading with the time they spend in engagement management, to find a teaching-management trade-off.

Project Potential

Before investigating the effectiveness of different strategies for teaching reading, it is necessary to determine how teachers presently structure the classroom time allotted for reading instruction. Researchers should observe teachers in the classroom to determine the amount of time spent teaching reading as opposed to time spent creating conditions conducive to teaching reading. It would be helpful to consider also the amounts of individual child time, small group time, and large group time.

It would be important to investigate how the amount of actual teaching time as opposed to engagement management time varies over the course of the school day. We may find that shifts in classroom format are rationally related to ease of management. That is, large group interactions may occur primarily during the first hours of the school day, with individual interactions concentrated in the later hours.

A further consideration would be how the length of teaching episodes varies. There may be consistent variations among classrooms in the average duration of single instances of teacher-student contact, even though the total amounts of time may be quite similar.

Project 3.2.1.2: Effects of Classroom Settings on Engagement Behavior.

Project Statement

Conduct classroom observations of student engagement behavior in a variety of settings for teacher-student interaction.

Project Potential

This project is designed to study student engagement behavior as it is influenced by the type of setting in which teacher-student interactions occur. A major function of this project is to provide qualitative assessment of various teaching formats (and the variations which may exist within these formats). Two types of classroom format variables examined by Hess (1974) were the size of the instructional group and the predominant direction of student orientation (toward teacher, or toward materials and peers). The results of this project would illuminate at least three general questions: (a) Do certain instructional formats for reading elicit and maintain consistently higher levels of engagement than other formats, or are there significant variations from teacher to teacher and from lesson to lesson? (b) Within a particular format (e.g., large group instruction) does the length of the instructional interaction affect student engagement? (c) Do certain types of instructional formats have effects on student engagement outside of the context of the particular lesson (i.e., does the format used by the teacher in the morning affect student engagement behavior in the afternoon)?

Project Research Considerations

There are a number of economies associated with any particular format for teacher-student interaction. With a large group format, for instance, a major advantage would seem to be the efficiency of transmitting information and reducing repetition of directions, assignments, explanations of new materials, etc., which often

characterizes more individualized approaches. There are also a number of fixed costs of time associated with a large group format, however. The time spent in getting the class to come together, to settle down, to listen to the teacher, may sometimes be a fairly substantial proportion of the total amount of time spent on a lesson. In many situations, then, it may be tempting for teachers -- once they have begun a large group lesson -- to continue in this format even after the students' engagement drops below effective levels.

On the other hand, in individual teacher-student interactions it may be more effective for teachers to have a larger number of shorter episodes. After each episode, children may be able to "sustain" themselves for a certain amount of time; increasing the length of the episode (within the limits imposed by the classroom situation) may increase only slightly the length of time that children can sustain themselves. It would be important to evaluate the effects of different instructional formats on student engagement.

An additional aspect of this project would be to determine whether different formats affect engagement not only during the actual interaction but also at other times during the school day. There may well be residual effects which continue to influence behavior; for example, students may be highly engaged during a large group lesson, but then later display much lower levels of engagement when involved in independent reading activities.

Project 3.2.1.3: Specific Teacher Behaviors and Student Engagement.

Project Statement

Investigate the relationship between student engagement in the classroom and specific teacher behaviors intended to elicit and/or maintain student engagement.

Project Potential

This project focuses on the relationship between teacher behavior and student behavior with respect to three general phases of classroom engagement: engagement elicitation, engagement maintenance, and engagement disintegration. Specific instructional strategies used by teachers may vary systematically among the different phases of classroom engagement. Raising or lowering the voice, changing the rhythm of presentation (or maintaining a consistent rhythm), and so on, are common strategies teachers use in eliciting and/or maintaining children's engagement. This information could serve as a starting point for developing systems to provide teachers with feedback concerning the effects of different strategies on influencing student engagement.

It seems likely that a first approach to this problem could be to ask teachers to discuss their classroom tactics and strategies. This area is probably one that teachers are able and willing to discuss with some sophistication. Following an exploration through interviews, it would be desirable to pursue the findings through directed, targeted classroom observations.

Project Research Considerations

This research could be divided into three areas: (a) determining the range of teacher strategies for engagement management, (b) determining the frequency with which teachers use different strategies, and (c) determining the conditions under which the various strategies occur. It is likely that individual teachers employ a variety of distinguishable strategies for engagement management, but there may be differences among teachers in the number of strategies available. Furthermore, there may be differences in the frequency with which individual teachers use various strategies, some appearing more often than others; and there may also be differences in the use of these strategies from one teacher to another.

After determining the number of different strategies and the frequency of their occurrence, it would then be appropriate to attempt to identify the conditions under which specific strategies occur. It is not obvious whether teacher behavior determines the state of classroom engagement or whether the teacher acts in response to classroom conditions. For example, it may be that teachers raise their voices in order to maintain student engagement; or it may be that they employ this strategy in response to the disintegration of classroom engagement. It would seem likely that teachers both react to existing classroom states and actively influence classroom engagement behavior. Thus, this research should consider both the antecedents and the consequences of particular teacher behavior in an attempt to identify the effects of classroom states on teacher behavior, and the influence of these behaviors on classroom engagement.

Project 3.2.1.4: Various Instructional Activities and Student Engagement.

Project Statement

Investigate the appeal of various reading activities in the classroom through engagement studies.

Project Potential

There are several different activities in a total classroom reading program. Most reading lessons are oriented toward developing a particular aspect of reading: oral reading, comprehension

skills, decoding skills, etc. This project focuses on the measurement of student engagement as a function of the skills being emphasized in a particular lesson. For example, one might expect that children generally would show higher engagement in reading comprehension activities than in decoding activities. If we find that decoding practice is consistently a low engagement activity among classrooms, then this finding would suggest that there is something inherently uninteresting in this activity. On the other hand, should considerable variation exist among classrooms, one might conclude that some specific teacher strategies are more effective than others in stimulating engagement in decoding activities. These findings would have important classroom implications for the teaching of various reading skills.

It is likely that individual children will vary in their engagement toward the different reading activities. It would be important for teachers to have such information in devising instructional programs which are more sensitive to individual variations in performance and in engagement behavior.

Project Research Considerations

An additional factor which may be of importance is the possibility of residual effects of particular reading tasks on engagement behavior at other times during the school day. For example, if a lesson designed to improve a child's performance in an area of weakness is presented early in the school day, a result may be to decrease engagement behavior in other reading activities (at which he is more proficient) later in the school day. On the other hand, early engagement in difficult activities may have little or no effect on later engagement. It would be important to investigate these questions prior to determining optimal schedules for various reading activities.

Project 3.2.1.5: Timing and Pacing of Teacher Activities.

Project Statement

Investigate the timing and pacing of teacher attempts to manage engagement.

Project Potential

There is reason to suspect that an important component of effective teaching is the teacher's skill in timing engagement management interventions. Teachers attempt to perceive children's "state of readiness" to engage successfully in a particular lesson, and the children's success or failure may depend upon the accuracy of the teacher's judgment. A basic investigation of the timing and pacing of engagement episodes might involve two approaches:

1. Interviews with teachers to ascertain their notions of effective timing and pacing strategies. It might be particularly useful to make videotapes of actual classroom situations and to solicit teacher comments concerning them. It would be interesting to compare the teachers' comments about videotapes of their own classrooms with their comments about videotapes of other classrooms. With regard to the latter procedure, we could solicit and compare teachers' comments about a "standard" videotape.

2. An ethological study of teacher and student signals. This study would extend the work of ethologists and anthropologists in the area of both verbal and nonverbal forms of communication (Hess, 1970). We could analyze observations (and/or videotapes) of actual classroom situations in order to identify the particular student signals that teachers use or ignore in interacting with students.

We could use both of the above approaches to compare teacher perceptions and teacher-student interactions early and late in the school year, in order to identify changes which may occur as a function of teacher familiarity with a particular group of students. Another analysis would compare experienced and inexperienced teachers.

We may find that an analysis both of teacher perceptions of student signals and of teacher-student interactions may identify several teacher types. A comparison of these findings with measures of teacher effectiveness may reveal significant correlations, suggesting that examining teacher timing and pacing strategies may be a useful technique for evaluating teacher effectiveness.

APPROACH 3.3

RESEARCH ON THE TEACHER

Approach Statement

Investigate the antecedents of, and the continuing influences on, teacher behaviors in the classroom as they influence engagement.

Approach Potential

The preceding approaches were directed toward studies of children and studies of the classroom process. This approach offers selected projects dealing with studies of teachers and teacher roles as they influence learning to read. In addition, we discuss the development of an evaluation instrument for classroom engagement.

We have no desire here to enter into research planning on teachers and teaching, because that approach would lead to a brief and inadequate discussion of extended research planning problems investigated by other panels of the NIE. Our suggestions in this area are limited to the suggestion of two thematic issues extending from the previous analyses and having implications for work at this broader level.

We suggest that studies of teachers' roles in creating classroom engagement reflect a developmental analysis of teachers and their understanding of their roles. The panel, in discussing teachers, came to the reasonable view that the teachers, like the children, must be regarded as developing and changing. We generally talk of teachers as fixed terms: people with definite styles, traits, abilities, knowledge, training, etc. But it seems likely that this view is as simplistic as the similar assumption about children. Therefore, one member of the panel prepared a general discussion of the development of teachers and the teaching role (Kemble, Appendix 2). Using this analysis as a basis, we propose only a few projects in the section below.

We also believe that studies of engagement might have some relevance for contemporary policy and planning discussions about education; the analysis of classroom engagement might lead to evaluation instrumentation that could supplement traditional achievement testing. Current discussions of what works or does not work in education are woefully hampered by the extreme restriction of our evaluation capabilities (Stephens, 1967; Mosteller and Moynihan, 1972; Jencks et al., 1972; White et al., 1973). We suggest here a project that might lead to the development of better instrumentation

for evaluating educational outcomes. Obviously, if some better and more diverse instrumentation were to become available, then extended research would be in order to reconsider some of the policy and planning questions that now are held to be moot because of the lack of sophisticated evaluation instrumentation.

Project 3.3.1.1: The Evolution of Teacher Attitudes.

Project Statement

Study the evolution of teacher attitudes toward teaching and the purpose of reading.

Project Potential

There may exist general teacher attitudes and behaviors which characterize particular phases of teacher development (see Kemble, Appendix 2). An important dimension upon which teacher attitudes may vary is the degree to which teachers perceive that teaching reading is a flexible enterprise. One might imagine two extremes of teacher behavior: content-oriented, in which the emphasis is on the transmission of specific bits of knowledge (for example, rigid adherence to a lesson plan for the purpose of teaching a specific list of spelling words); and concept-oriented, in which particular lessons are means toward a general end of learning to read and not ends in themselves. Concept-oriented teachers are concerned with the transfer of specific information, but they approach the teaching of specific content with flexibility, keeping their sights on the long term goal of learning to read. There are other dimensions of teacher attitudes which may also be worthy of investigation.

The investigation of phases of teacher development would require the construction and validation of an instrument to assess the attitudes of the teacher toward teaching and the purpose of reading. Recent research efforts (Perry, 1970; Levinson et al., 1974) have focused on developing techniques for measuring different stages in the growth of thinking in adults. Perry (1970) has investigated adult attitudes toward the nature of knowledge. The work of Levinson and others (Levinson et al., 1974) identifies several periods of adult psychosocial development. The development of an index for assessing teacher attitudes would involve modifying existing techniques to fit this specific purpose.

Once we have developed a teacher attitude index, we can evaluate the attitudes of teachers with varying amounts of experience in order to determine if there are regularities in attitudes conforming to a stage hypothesis of teacher development. If predominant trends are shown to exist, there may be corresponding trends in teachers' classroom management techniques, inasmuch as one might expect that teacher attitudes are related to teacher behaviors in the classroom.

Project 3.3.1.2: Relationship of Teacher Attitudes to Teaching Behavior.

Project Statement

Investigate the relationship between teacher attitudes toward teaching and teacher behaviors in the classroom.

Project Potential

After identifying regularities in teacher attitudes which may correspond to different phases of teacher development, we could attempt to identify the teacher behaviors associated with particular attitudes. Teacher behaviors may be divided into two categories: (a) the general formats teachers use in presenting reading lessons (e.g., student orientation toward teacher vs. orientation toward materials and peers, size of instructional group, etc. [Hess, 1974]), and (b) the particular behaviors characteristic of the teacher's style of presentation (e.g., tone of voice, verbal and nonverbal cues, etc.). Ratings of teacher attitudes may be related to both global and specific teacher behaviors. This investigation would illuminate the particular teacher behaviors associated with various teacher attitudes, if such a relationship between teacher attitudes and behaviors does, in fact, exist.

One may expect a relationship between teacher behaviors and student engagement in the classroom (see Approach 3.2); therefore, attempts to stimulate student engagement would tend to focus on identifying and developing successful teacher behaviors. If we find a relationship between teacher attitudes and teacher behaviors, then an additional strategy for optimizing student engagement may be to focus on the development of optimal teacher attitudes (possible through teacher training, and/or teacher support systems).

Project Research Considerations

Teachers may subtly transmit their attitudes to students and thus affect student engagement, even if a relationship between teacher attitudes and overt teacher behaviors is not easily observable. For this reason it may be useful to investigate directly the relationship between teacher attitudes and student engagement. We may find that certain teacher attitudes are generally associated with higher levels of student engagement than other attitudes, even if the classroom format and general teacher behaviors are similar. Such a finding would also suggest that developing certain teacher attitudes toward schooling may be an effective means of stimulating student engagement.

Project 3.3.1.3: Teachers' Awareness of Their Own and Student Behaviors.

Project Statement

Investigate the teachers' awareness of their behaviors and student engagement behaviors in the classroom.

Project Potential

It would be interesting to conduct observations of ongoing activities in the classroom and relate this information to teacher perceptions of what happened during this time period. Relevant categories for comparison might include: (a) teacher time spent in teaching reading or related activities; (b) total student time spent in reading-related activities; (c) level of student engagement with respect to various classroom activities; and (d) time spent in teacher-oriented vs. material- and peer-oriented activities. A comparison of teacher ratings of classroom activities with observations of actual classroom activities would provide an index of the accuracy of teacher perceptions. This index may prove useful for at least two reasons. First, such an index could provide teachers with feedback concerning actual classroom activities. For instance, teachers may overestimate the amount of time when students are actually engaged in reading-related tasks, and may therefore want to adjust their teaching strategies accordingly. Second, the accuracy of teacher perceptions may be one factor which differentiates between successful and unsuccessful teachers with respect to their ability to stimulate classroom engagement. For example, teachers of students showing high engagement may be more aware of the fluctuations in the level of student engagement with the changes in classroom agenda than less successful teachers. If this proves to be the case, it may be beneficial to devise teacher training programs to improve the teacher's skill in assessing the levels of student engagement in the classroom.

Project 3.3.1.4: Teacher Performance Cycles and Student Engagement.

Project Statement

Investigate the relationship of teacher performance cycles to student engagement in the classroom.

Project Potential

Several research efforts have focused on the time-of-day variations in adult performance on a variety of tasks (Kleitman, 1963; Colquhoun, 1971). Most studies seeking fluctuations in on-the-job

performance have taken place in business and industrial settings, with work output measures (such as typing speed, piecework rates, etc.) considered as outcome variables. Other studies have focused on variations in performance on laboratory tasks such as reaction time and vigilance performance. Unlike the rather restricted social settings in which the on-the-job studies have taken place, the classroom is a flexible and varied social environment. Thus it is possible that teacher performance cycles may differ from the adult cycles identified in previous studies.

There are difficulties in identifying an on-the-job performance variable for teachers. It would be difficult to determine whether fluctuations in teacher behavior are a result of performance rhythms or a response to changes in student behavior. For this reason, it would seem more productive to focus on identifying variations in teachers' performances on laboratory tasks (RT, vigilance, etc.). If we can identify regular cycles in teacher performance, it would be interesting to compare these fluctuations with observable student engagement cycles. Approach 3.1 focused on the identification of such cycles in children. One might expect that periods of high student engagement would coincide with periods of high teacher effectiveness (as measured on the laboratory tasks). It is possible, however, that these cycles may not coincide because of scheduling and other school constraints.

One major implication of this investigation would be to determine whether periods of reading instruction occur at times of optimal teacher effectiveness. If student and teacher cycles coincide, then it would seem that reading periods should be scheduled accordingly. If the cycles do not coincide, on the other hand, it would be necessary to consider the possible trade-offs between optimizing teacher effectiveness and optimizing student engagement. It is likely that in adults the effects of naturally occurring cycles may be minimized by compensating mechanisms such as purposeful efforts to increase concentration, or superior language skills, while children may be less able to overcome the effects of naturally occurring cycles. Thus it may be that student rhythms should be the primary indicator of optimal times for reading instruction.

Project Research Considerations

While it may be that naturally occurring performance cycles affect teacher behavior in the classroom, it is also possible that the social context of the classroom may exert an influence on these cycles. The school setting demands optimum effort from teachers at specific times during the day, and these times may not correspond to optimum phases of teacher performance rhythms. It would be interesting to measure the teachers' time-of-day performance variations upon entry into teaching and at various points during their first year. We could also measure performance cycles of more seasoned teachers before the start of and during the school year.

Naturally occurring rhythms may become entrained to the rhythm of the school day. If teachers' natural cycles prove to be malleable, then optimal schedules for reading instruction should be determined principally by student engagement cycles.

Project 3.3.1.5: Measures of Classroom Engagement.

Project Statement

Develop measures of classroom engagement to be used as indices of school quality.

Project Potential

Teachers and principals regularly make short term judgments about the effectiveness of various teaching strategies. Whether or not we have a science of evaluation, there is certainly a regular practice of evaluation in schools, and it is likely that these evaluations show a reasonable degree of reliability. It is also likely that these evaluations are a result of intuitive estimations of three basic factors: (a) whether classroom organization, discipline, or control exists; (b) whether there is engagement on the part of the students; and (c) whether effective teaching is going on, as estimated by criterion-referenced judgments.

Could one develop a standardized, objective form of these intuitive judgments? Apparently there has been some progress toward this goal in the development of the Index of Classroom Quality at Columbia University. The value of such an instrument would seem to lie in its close agreement with the judgments of seasoned teachers, in its ability to reflect short term changes in classroom quality, and in its ability to adjust to changes in the goals and objectives of ongoing programs in schools. In these areas such an instrument would seem to be more sensitive than existing measures focusing on student achievement. One disadvantage of such an instrument (as opposed to measures such as achievement tests) is that it is cumbersome: it is an observational instrument. This disadvantage is not absolute, however, in that it allows for sensitivity to factors which may not be easily detectable through other means. Another disadvantage is the fact that it is not validated.

Project Research Considerations

Routines for the construction and validation of standardized tests are well known and could be applied to the construction of an engagement index. It would seem useful to conduct a series of studies comparing an engagement index to other measures of the effectiveness of classroom instruction (e.g., criterion-referenced tests of achievement). If such an index were repeatedly successful, it might achieve a degree of "standing" as a valid measure of educational quality. Assuming partial validation of an engagement index, there would seem to be a multitude of classroom applications.

INTRODUCTION TO APPENDIXES

Appendix I outlines the preliminary ideas which seemed important for a research agenda on attention and motivation. The final panel report refined and expanded this preliminary outline, but the general concerns remained the same throughout the process: to identify means by which schools might maximize children's engagement in learning to read. The panel viewed the factors of attention and motivation as relevant to children's engagement, and these factors were the focus of the research suggested.

Appendix I also contains the responses of the researchers who read the preliminary outline of the research programs. The panel encouraged them to comment on the value of the specific programs, to suggest additional or alternative programs for research, and to submit information papers relevant to the panel's problem area. The panelists consulted these papers during the formulation of the final agenda, and discussed ideas from some of the papers during the panel meeting for incorporation into the final report.

In its attempt to focus the report directly on the issue of attention and motivation, the panel found it necessary to omit some ideas which seemed valuable to consider in the general context of reading, but which did not seem to fit within the specific purview of the panel. Specifically, two panelists wrote papers which have been included in Appendix II of this report. The first paper, by Betty Bryant, discusses a set of research proposals directed at understanding the acquisition of literacy in normal children. The second, by Eugenia Kemble, discusses the way teachers develop in their role and the consequences of this development on students. Under a different conception of the problem area, the issues raised in these papers might have been central to the research agenda proposed.

APPENDIX I

Entries in a Research Program on Attention and Motivation

by Sheldon White

with reactions by: Eva Weiner
Joseph Glick
David Rose
Robert Hess
Arthur Blumenthal
Jerome Kagan

Entries in a Research Program on Attention and Motivation

by Sheldon White

PROBLEM AREA 1.

Develop means to allow teachers to estimate optimal environments for sustained work on reading. The problem is that of providing for continuous estimation by the teacher as well as that of providing resources and arrangements so that the teacher can make individualized "moves" based on such estimation. The basic assumption is that children differ in the nature of the environments they can use. Additionally, individual children will vary within and across days in their usage of specific teaching environments.

Approach 1. Examine some of the mechanisms by which children extend thought and action over real time.

Program 1. Study the functions of rhythm and ritual in the learning of very young children. Explore the utility of rhythm and ritual for stages in and circumstances of learning of older children and adults.

Program 2. Study the phenomenon of concentration gradients or "problem-solving states" (Malmo, Kahneman, Germana, Elias).

Extend Eliot's work in an attempt to establish whether the emergence of such states at older ages constitutes a phenomenon of maturation, or a development of the ability of children to construct such states to problems set by others.

Study the natural occurrence of the psychophysiological phenomena marking such states during children's reading, and relate their occurrence and sequence to comprehension.

Program 3. Study the ontogenesis of neuropsychological systems that might reasonably be related to the development of attentiveness and attention span in children.

Project 1. Study the development of fast EEG and evoked-potential components.

Relate these (as Surwillo has) to reaction and action speeds, particularly speeds attainable in decoding.

Explore the relationship between speed of decoding and comprehension.

Project 2. Develop a more differentiated understanding of the ontogenetic patterns of delta, theta, and alpha EEG components.

Of particular interest is theta as an index of hippocampal activity, because of the implication of the hippocampus in establishing an attentive state.

Study the intercurrent manifestations of EEG and other psychophysiological indices as moment-to-moment indicators of absorption in the act of and retention of the content of reading.

Approach 2. Examine some of the internal factors that influence (facilitate or interfere with) the ability of children to extend thought and action over real time.

Program 1. Develop a more elaborated understanding of natural rhythms which influence children's performance: circadian rhythms, Kleitman's rest-activity cycle, possible rhythmic factors involved in "attention waves"- EEG "nonspecifics," etc.

Explore Prechtl's finding of 22% choreiform symptomatology in children identified as poor readers.

Program 2. Develop a more elaborated understanding of states in children of reading age, and of the transition rules governing changes of state.

What kinds of reading comprehension are optimized in each state?

Examine the possibility that good readers (and children who have been identified as being gifted in other areas of ability, such as spatial ability, who may or may not be good readers) are better at state management than are poor readers.

Program 3. Explore the problem of multiple agenda -- cognitive, social, and mood-tension -- and the continual matching and mismatching of children's and teachers' agenda over real time.

How do the child's "intentions" match with the specific kinds of problems set by others? What kinds of "reading comprehension" are most sensitive to matching or mismatching agenda?

Approach 3. Examine some of the external factors that influence or interfere with the ability of children to extend thought and action over real time, with a particular interest in those factors that are manipulable by the design of the classroom environment, or temporal organization (of the schedule), or by the moment-to-moment management activities of teachers.

Program 1. Develop a more differentiated understanding of external "load" factors (noisiness of the cues, separation of events in time and space, relative salience of significant cues) as they influence task performance.

There seems to be a basis in the literature, now, for a more theoretical and synthetic understanding of competence-performance trade-offs. Try to develop that theory.

Program 2. Examine the real-time sequence of events in more highly structured learning environments (behavior modification procedures, classrooms that are intuitively perceived as more structured, experimental arrangements for the study of learning and problem solving).

Try to define and elaborate the arrangements and moves of attentional management.

Contrast these with more open, free play, discovery kinds of environments.

For individual children, try to identify the interaction of these environmental factors with child, or with state-of-the-child (Pierson).

Program 3. Examine the moves and stops of attentional management in spoken language, then in written language.

Program 4. For teachers diagnosed by their peers as good or bad, able to handle a class or not, examine their moves and stops in classroom management over real time.

Identify various ways to "be good teachers" and their implications for various types of children (consumers, customers) in their approach to reading.

Approach 4. Examine some of the other ways, or the knowledge-action systems, in which children do extend their thought and action over real time, e.g., visuo-spatial knowledge systems.

Consider the visual- vs. auditory-minded distinction (Kuhlman), and how children's preferences interact with their approach to, absorption in, and retention of different domains of reading comprehension.

Discussion of Problem Area 1: It would be a serious mistake to proceed on the assumption that teachers do not now practice attentional

management or that teachers do not take into account the kinds of factors being considered here. Some teachers do this very well, some less well. What research can do is make the process of attentional management more explicit and somewhat more systematic.

Why bother? What can research achieve for teachers who are already in business, fairly successfully, with regard to these issues? Explicit formulations might allow the following possibilities:

1. Less gifted or motivated teachers might be more quickly able to recognize the possibilities of such activity.

2. There will be some encouragement for the provision of administrative resources to allow the teachers to act flexibly.

3. Children now sloughed off as "dumb" or "less competent" may come to be recognized and handled as special problems in attentional management.

4. A surer, more legitimate diagnosis can be made of children who are now set aside as children with "learning disabilities." Conceivably, we might find routines of extreme environmental management to substitute for amphetamines.

PROBLEM AREA 2.

Explore the possibility of a more natural use of text in classrooms.

Develop a more natural, and more diverse, system for assessing children's competence with text (for assessing reading comprehension).

Approach 1. Develop a more differentiated understanding of the mature and functional use of text by adult readers.

Program 1. Study successive instances of encounters with text by skilled readers. Attempt to estimate:

1. Those kinds of cognitive change or experience that the reader is trying to optimize;

2. Sampling and scanning patterns of the reader in relation to the above;

3. Kinds of comprehension that ensue.

Program 2. As a contrast case, study spoken dialogue in terms of the issues above (i.e., in Program 1).

Program 3. Study skilled readers who use text a great deal vs. skilled and unskilled readers who do not use text very much. How does the taxonomy of "readings" and "comprehensions" compare among these groups?

Approach 2. Design curriculum units in which children use encounters with text functionally in diverse ways. For each, design criterion-referenced evaluation procedures. From teacher and parent judgments, estimate how well these units seem to work in classrooms.

Approach 3. Attempt to establish the hidden rules (agenda) of traditional comprehension testing as a game. Analyze what kinds of cognitive changes are being optimized.

Attempt direct teaching of children in ways of scanning and sampling in order to increase success at the game.

Discussion of Problem Area 2: The program discussed here is brief, but the issue is one of considerable challenge to present practices of teaching reading comprehension.

Schools teach reading in a peculiar, stereotyped, unnatural way. Skilled readers do not read all text in the same way -- they do not seek a fairly standard kind of reading comprehension. Only in schools do people read text that they have no particular desire or need to read, storing arbitrary information in order to second-guess the questions that will come from the teacher or the test the teacher gives. There may be a kind of validity to the reading comprehension exercise as a training device, an artificial routine analogous to the finger exercises in music training. But, most reasonable music training mixes finger exercises with the playing of simple real musical pieces. The intent of the work here is to explore the possibility of something analogous in the development of reading comprehension in children.

PROBLEM AREA 3.

There is another issue in the study of motivation to read, a more traditional kind of issue, for which no program is offered here. As an educated guess, something like a "cathexis" of books and reading exists for some children and not for others, because of factors in the home, imitation, identification with parents, etc. This sort of phenomenon may not be readily manipulable by schools and teachers, per se. School-family collaborations, of the kind recently advocated by Bronfenbrenner, may influence it.

Response to "Entries in a Research Program on Attention and Motivation"

Eva Weiner

The paper, "Entries in a Research Program on Attention and Motivation," contains important ideas for everyone concerned with reading problems. I hope the analogies between the issues confronted among younger children and the language problems of older children will be included in the research, for high school students show the same oscillation of reading skills in a "now you see it; now you don't" syndrome. They misread or misspell words at one point on a page and produce them correctly at another: e.g., hear-here, no-know, etc. They omit letters: e.g., Sana Fe-Santa Fe. They omit words in a sentence; e.g., "I made at last!" for "I made it at last!" They scramble the sequence of letters: e.g., scread-scared, veiw-view. In short, they make the same kinds of errors they have been making since their early school days, despite many years of remedial help.

Perhaps the emphasis should be on remedial writing instead of on remedial reading throughout the grades, for suddenly, in high school, the demands for written work overwhelm some students who cannot produce a sentence without assistance. However, with individual help in translating their thoughts first into oral expression and then into written expression, they learn to write; and at the same time, their reading comprehension improves without the use of special comprehension exercises.

But the gains made in high school come too late to overcome the trauma of earlier testing failures. For this reason, some students with the intellectual capacity for higher education are afraid to take the SAT exams, or do poorly if they do take them, despite the availability of an untimed version. Since research findings indicate that untimed scores are usually not better than timed scores, investigation of the reasons for the ineffectiveness of extra time alone might lead to a better way of evaluating students with language problems. A more crucial factor than time might be the method by which the student's knowledge system is put into action. Students with poor old systems continue to use them because the newer system is still too uncertain to be trusted. A clear instance of this situation occurred during end-of-the-year testing of a tenth-grader who had been in the L.D. tutoring program in junior high, too. He read aloud the same list of 100 words used the preceding year and made as many mistakes. Without confidence in his phonic knowledge, he used first letter similarities to guess, making 38 errors. An outside evaluator might have interpreted this score as lack of knowledge. But as his teacher, I knew he must have learned something during the year, and I decided to retest after a few days. With reminders to slow down, to

use a phonic and syllable attack, and to stop guessing, he made only 16 errors instead of 38. I suspect that test results for many children, including those in the Head Start Program, are invalid measurements of what the children have learned and of what they could produce with more appropriate management of the testing situation.

The advantage of studying older children is that they can verbalize about their problems if they are made consultants in their own remediation. Instead of teachers having the sole responsibility for estimating the optimal environment for each student at any given time, teachers and students together decide whether the student can sustain attention on a particular activity; if not, students may ask to shift to another because they are tired, tense, hungry, etc. Students' ideas were included in the following list of suggestions for modifying the academic environment.

Suggestions for Modifying the Academic Environment

1. We could structure English and math courses to reintroduce elementary reading, writing, and arithmetic facts before presenting newer, higher level material.

2. We might post helpful cues in the classroom for easy reference: the alphabet, special vocabulary lists with definitions, geometric forms, fraction charts, multiplication tables, etc.

3. We might give an alternative assignment when the regular one is too difficult: projects, oral presentations, etc. Talking Books (on tape) are available at libraries, and students could use them in lieu of required reading.

4. Slow readers or writers might have extra time.

5. We could use oral testing and differentiated grading for a truer picture of ability and achievement.

6. Mimeographed assignments might be more effective than oral ones, which students forget or misunderstand more easily. We would have to take some care with the quality of the reproduction, because handicapped students cannot always identify blurred or missing letters. Blue-blindness is another possible problem in mimeographed pages.

7. Special reminders and mnemonic devices might help memory deficits.

8. The use of concrete examples and analogies, particularly in figurative language might facilitate understanding of abstract ideas.

9. We might encourage meaningful, significant thought processes by stressing the relationship of one idea or experience with another.

10. We might encourage learning by listening by freeing the student from the fear of being called on to read aloud.

11. Faulty listening might be the cause of misunderstanding leading to argumentativeness and defensiveness in class discussions. The teacher might direct attention to the relevant aspects of the subject.

12. We could monitor the straying attention of highly distractible students by keeping them in direct line of vision and giving them a signal when necessary. Teachers could facilitate lip-reading and board-reading by proximity, provided teachers speak only when facing the class and write legibly, avoiding yellow chalk on a green board, an invisible combination for some of these children.

13. Teachers might handle emotional problems accompanying the primary handicap of learning disabilities more effectively if they recognize the possible manifestations: vulnerability to stress, impulsivity, low self-esteem, impaired self-direction, suggestibility, short-sightedness, short-temper, and poor social skills.

14. One-to-one conferences might serve to reveal the breakdown point in problem-solving processes, particularly those involving abstract concepts.

15. Positive qualities of those who have suffered failure might be used to minimize negatives: perseverance to repeat, review, rewrite; willingness to face problems and rise above failure, pain, and frustration; compassion and willingness to help others who have suffered.

The uniqueness of learning styles found in these children requires individualized teaching and a modified curriculum, causing additional burdens upon classroom teachers; however, the rewards of salvaging academic failures outweigh the extra effort required initially.

Response to "Entries in a Research Program on Attention and Motivation"

Some Notions About Reading

Joseph Glick

The problem of reading problems is a multilevel affair having to do with perceptual selectivity and integration on one end and the extraction of meaning from textual materials on the other.

While my ideas do not fall neatly into line as a systematic approach, I do have ideas about several of the levels that may be involved, all of which share a common thread.

The basic stance that I have taken in my work over the last few years is that one should consider human behavior as intentional action, motivated by an internal theory of appropriate behavior, and conditioned by contextual constraints serving to elicit one or another internal theory and program of action. Accordingly, behavioral manifestations are not so much symptomatic of an organism's capacity, but are rather to be considered as a particular deployment of skills marshaled and used in the service of some theory of "what is the appropriate thing to do in some situation." Changes in the theory of what is appropriate or what is usable on some construal of appropriateness may then change displayed capacities. In this manner the concept of intention defines the intersection between motivation and the deployment of attention.

Research and intervention might best proceed, according to this viewpoint, by a strategy which seeks to establish and interweave two distinct inputs. The general plan would be to establish conjointly a "job analysis" of the component skills involved in (e.g.) reading, and an "ethnographic" analysis of children's ordinary activities and implicit theories bearing upon the targeted skills involved in the job analysis. The basic notion involved here is that it is unlikely that one would have to proceed de novo to import skills which are not in existence but rather that one should be likely to find skills embedded in a variety of functional contexts which may be redeployed for use.

Perceptual Level

On the perceptual level there already exists some evidence pertinent to this viewpoint which might bear systematic expansion as part of an NIE concerted effort. Jackie Goodnow and her collaborators have recently uncovered a great deal of systematicity in the way in which children go about copying a figure. They have uncovered a series of rules which bear both upon starting and ending points and

upon rules of procedure in drawing which seem to characterize children quite generally. For example, in drawing children often adopt a procedural routine which takes them from the topmost and leftmost portion of a to-be-copied figure, either downward or to the right, or preferably both at the same time. While such systemacity of behavior is interesting, what is important for this discussion is that there seems to be a relationship between this rule system and commonly made errors in reading. For example, it is quite common for children to confuse b and d in reading. This confusion is not a "random" performance (which would be indicated by reading b for d and d for b equally often) but is a systematic error relatable to the rules of drawing. If drawing rules were strongly related to reading errors one might expect that the "letter of preference" would be b since the figure is oriented toward the right (and starts at the top). Goodnow reports that a great preponderance of b/d confusions involve reading the preferred letter b for d.

While this field of data suggests a relationship, it is difficult to tell whether the drawing rules derive from "reading habits" (which over-generalize in the b/d case) or whether there is some independent determinant. Some informal observations of Goodnow suggest that Hebrew readers show the same drawing rules. Accordingly it is quite possible that we are dealing with developmentally independent functions which nonetheless have some functional relationship to one another.

Finally, Goodnow (personal communication) has claimed that there is some malleability in procedural drawing rules. If the task is changed from copying to tracing, the rules of starting and ending reverse.

It would seem that followup studies bearing on these interesting observations are very much in order. A series of questions might be asked:

1. Can one establish more clearly the association between drawing rules and reading problems? For example one might expect to develop measures concerning the robustness and strength of these rules. (Are they invariably applied? Are they applied at the cost of some more efficient organization of a task at hand?) After such measures have been developed, one might then measure the association between strength of rule and likelihood of "rule-determined" errors. (In this latter situation, one assumes that there is individual variation in the strength of rules -- and if additionally there is individual variation in "type of rule" one might then examine more strongly the interdependence of drawing rules and reading errors.)

2. Can one establish the "sources" of drawing rule-reading error associations? Here one could do microcross-sectional or longitudinal studies relating reading skills and errors

to drawing strategies. One might be able to answer questions relating to temporal association between the two.

3. Might one devise other relationships between types of reading errors at the perceptual level and other sorts of skills (like drawing) in order to broaden our understanding of these sorts of associations?

4. Finally, can one gain entry into the system to the extent of understanding the conditions of applying the rules so that one may learn how to deploy rules in certain circumstances and not to deploy them in other circumstances? Stated more traditionally, can one introduce differentiation by means of altering elicitation contexts?

Perceptual-Conceptual Interrelationships

Recent work in the neurological organization of behavior has begun to suggest that an overall scheme which looks at behavior as the result of an organization of skills relevant to intentions may be very productive. Trevarthan, for example, in his work with split brain patients and the early development of action routines has repeatedly stressed that neurological processes are organized in the service of intended action and that characterizations of physiological structure must necessarily take into account functional states of organization.

While my ideas on this subject are not fully or explicitly developed, this area of research seems one which is capable of great payoff in the reading area.

It appears that reading requires the rather precise intercoordination of neurological systems on at least two levels. On the one hand, focal perceptual processes involved in letter identification, etc., must be "located" within some general spatial framework (inasmuch as many of the differentia between letters, etc., involve spatial distinctions). These processes would implicate some mechanisms tying right hemisphere functions to subcortical processes involved in general orientation. Secondly, the results of perceptual identifications must be intercoordinated with linguistic analyzers for the extraction of meaning that reading involves. This intercoordination would implicate interhemispheric coordinating mechanisms.

While at present we have some knowledge of the locational or structural aspects of these functions, we have little in the way of knowledge about the dynamics of these types of functional organizations. Trevarthan in recent work, stresses the "intended" character of structural interorganizations.

I think that we will want to build on the suggestions coming out of split brain work and try to understand the relationship between central intentional states and the deployment of physiological processes. From a developmental point of view we will want to expend effort on attempts to detail the mechanisms and indices of interhemispheric integration under a variety of directive states.

Should reliable indices of adequate intersystem organization be developed one would then examine routine activities of children to see which score most highly on integratedness and possibly use these activities as vehicles for the development of reading skills.

Conceptual Level

At the conceptual level we are most concerned with problems of reading comprehension. Recent work by Bransford, Barclay, and Franks (1972) suggests that the appropriate level to investigate this problem is at the level of processes which integrate information at a paragraph (or general idea) rather than a sentential level. Unfortunately much psycholinguistic work has been oriented toward intrasentential relationships. NIE should encourage linguistic work oriented toward those features of syntax or semantics which can be appropriately described as applying between rather than within sentences. Perhaps a useful group to approach on this would be those involved in sociolinguistic questions who attempt to relate sentential processing to larger contextual spheres. A likely candidate would be a cognitive sociologist such as Aaron Cicourel or an ethnomethodologist such as Harvey Sacks.

Research in these areas could be directed toward uncovering the means by which people establish relevance between successively encountered units of information. What we need is some knowledge of the means by which people make linkages and achieve integrations in textual materials. There is something to be learned from systematic treatments of problems of interpretation or hermeneutics. What literary critics and people dealing with hermeneutic problems have not approached, however, is a treatment of relevance-making in psychological and process terms.

In some of my earlier work with Cole (Cole, et al., 1972) the problem of relevance-making was seen to be particularly prominent in our studies of organization in memory and in problem-solving tasks. Here we found that often it is the "presentational framework" which determines how we see what is relevant to what. For example, if a person reads a list of items as a list, that person will not cognitively cluster the items; however, if one reads that same list as part of a parable where there is some "motivation" in the structure of the parable for the clustering of items, one will cluster the items. We have as yet only rudimentary and post hoc notions of the availability and extensions of such presentational frameworks.

Accordingly, some frankly ethnographic studies, looking systematically at those situations in which units of information are integrated over space and/or time in mundane life, might be productive for discovering appropriate means for fostering comprehension processing. For example, children often show a great deal of sophistication in constructing relevancies between items of information in their analysis and understanding of sports events. The selection of a pinch hitter or prediction of a football play requires and manifests rather complex handling of inputs which are made mutually relevant and serve to condition one another. This dexterity may be just the sort of skill involved for paragraph comprehension.

The basic list of potential situations could be expanded greatly. The general notion is that by understanding natural occurrences of skills akin to those involved in reading, we may yet find resources we can deploy for improving reading skills themselves.

Response to "Entries in a Research Program on Attention and Motivation"

David H. Rose

If I may move through the outline backward, my prejudices will appear in better logic. I wish, moreover, to make one bias explicit early. That bias is toward the solving of problems in instruction for those specific children who learn to read slowly or poorly rather than toward the general improvement of reading instruction. While these two goals are certainly not mutually exclusive, the degree of overlap is a major experimental question to which I address parts of this outline. As a consequence of that bias, I give low priority to certain programs (as in Problem Area 2) which may otherwise be valuable in a wider context.

Problem Area 3

Abstractly, this area strikes me as both the least workable and the most important. It seems most important because it appears that attention and motivation are inevitably confounded in most of the kinds of research suggested in other sections.

Recent work at both behavioral and physiological levels has dramatically emphasized the effort required of the organism to sustain attention over time (Pribram and McGuiness, 1974; Kahneman, 1973). Whether or not the substance of that effort is the overcoming of normal tendencies toward habituation and distraction, as has been suggested, it is clear that sustained attention or cognitive effort comes at psychological and physiological cost to the organism. That cost is met logically only in the context of motivation. (Anatomically, as well, it is now clear that those brain centers usually implicated in the control of attention -- prefrontal association cortex, hippocampus, etc. -- are intimately connected with the hypothalamus and other brainstem "motivational" sites. See, for example, the relationship between brainstem self-stimulation sites and prefrontal cortex in Rolls and Cooper, 1974.)

As a consequence of the costs of attention and the effort involved in sustaining it, to deal with attentional issues is inevitably to deal with motivational ones. A recent physiological study by Preston, Guthrie, and Childs (1974) points to the problem of confounding. The study, looking for neurological differences in disabled readers, measured the amplitude of one of the late negative components of the visual evoked response from the area of the angular gyrus of the parietal lobe (see Problem Area 1). The researchers found a difference between normal and disabled readers. Unfortunately, a neurological deficiency interpretation is questionable because the

same kind of amplitude differences are usually reported for different intensities of attention. Similarly, an attentional deficit interpretation per se would be questionable without considering whether the disabled readers were equated with normal readers on the motivation to perform this sustained attentional task.

The point is as simple as it is problematic. If children enter schools with different motivations to attend to reading-like activities, then research in Problem Area 3 is of obvious centrality, for that difference becomes an enormous compensatory effort. Moreover, the problem would not be limited to motivation to read, but to differences in agenda as discussed by White, to differences in locus of control and competence motivation, to differences in motivation to be obedient in the face of authority, etc.

Obviously this Problem Area is least workable because the implications of research would probably turn out to be more cultural and political than clearly instructional (Jencks' arguments are related). Whether cultural and familial intervention is desirable seems to me not entirely an empirical question (with apologies to Skinner) nor one for educational planners. Whether it is successful is an important element in that decision, and I believe such studies have high priority. For practical matters, noninstructive day-care environments may provide a research tool.

Problem Area 2

Given that one's interest is primarily in those children who have difficulty learning to read, this problem area (exploring the natural use of text, developing more diverse assessments, etc.) seems the least valuable on several counts:

1. On the major thrust of studying "a more natural use of text," a promising area, much literature is already available and has been widely circulated for some time in various "organic" approaches to reading (see, for example, Sylvia Ashton-Warner). The success of such methods (unfortunately usually confounded with teacher style, warmth, etc.) has been given sufficient informal documentation in a wide variety of the most difficult contexts to become acceptable.

   The major point of research interest would seem not to be whether such natural uses of text are an improvement (they are) but why there is such reluctance about their adoption. Certainly, much impediment comes from publishers, but it seems clear that teacher style and conservatism also play a major role. The ethic of work and regimen that composes the strong "hidden curriculum" of American schools seems stronger than any desire yet for an easy or "natural" road

to reading. The schools are still involved in "testing" motivation as much as building it.

2. It has been my experience that poor readers are separated from good readers, not at levels of comprehension skilled reading, but at the very first stages of instruction in letter-naming, sound-symbol correspondences, look-say, etc. (depending on the method). Indeed remarkable predictions about the later success in skilled reading and comprehension can be made from simple "reading readiness" skills at the preschool level (e.g., Jansky and Dehirsh, 1972). Quite simply, learning difficulties in reading exhibit themselves early, before any kind of "text" is used, no matter how "unnatural," and before comprehension is a meaningful concept. The factors on which teachers separate "Bluejays" from "Canaries" are neither particularly subtle (with reservations from Rosenthal) nor late-developing.

   A case in point is readers in dialect which were advocated by linguists in the late 60's (Baratz and Shuy, 1969, for example). They believed that black inner-city children would benefit from beginning with readers which more closely approximated their dialect, the implication being that a substantial part of the reading difficulties of inner-city children as a group came from reading in texts which were less "natural" for them than for white children.

   It was, of course, not a very fruitful position on several grounds, including the obvious point that there is absolutely no similarity between any normal child's dialect and the jargonese of beginning readers. More important, however, was the fact that the linguists failed to note that black (and white) inner-city children did not begin to fall behind as they began to read and comprehend sentences but much earlier, at much simpler levels.

3. Points 1 and 2 are not as much at odds as they appear. While there have been reports of successful use of various more "natural" usages of text (including children's own verbalizations) one of the major questions I usually find unanswered is whether any such techniques are differentially successful in removing the problems of those who do poorly in traditional texts and styles. There are at least some indications that quite the contrary may happen (open structure may be differentially unsuccessful with the poorest learners). Those teaching styles and texts that are stilted, unnatural, dull, etc., are probably an unnecessary burden on all children (and should be changed as suggested above), but these factors may actually account for none of the specific problems in learning to read that differentiate the slow learners. More research (Problem Areas 1 and 3) on these differences is needed.

Rather than study the mature and functional use of text by adult readers, it would seem more appropriate to adapt Program 1 to the study of encounters with text by good and poor readers at early stages in reading. How do scanning and sampling patterns of poor readers differ from those of good readers? How do their initial encounters with orthography differ in intensity, extent, etc.? What manipulations might change these differences, if any?

Problem Area 1

Approach 1:

Program 3:

It sould seem particularly valuable to study the normal developmental differences in two specific neocortical areas rather than ontogenesis in general.

1. Prefrontal cortex is that area most frequently associated with attentional control in maturity. Recent work suggests that this area, one of the late-developing association areas, probably begins to attain functional maturity at 5-6 years (Luria, 1973), an important age period in the development of the child and significantly, the time formal schooling begins and attentional control is expected.

   Lesions in this area, and presumably anatomical immaturity, result in a number of specific deficits in voluntary attentional control associated with both young children and brain pathology. Developmental differences here (especially developmental lags) would ensure specific difficulties in normal classroom instruction in reading. While the ontogeny of various general frequency bands (alpha, delta, etc.) may be useful in charting the general physiological development of the brain, we would obtain better information from measures more specifically related to frontal development. My guess is that the negative steady potential shift observed over the frontal cortex in directed attention and expectancy (The CNV, [Contingent Negative Variation], Walter et al., 1964) would hold the most promise as a future diagnostic and indicator of frontal maturity. (Again I have to emphasize that the CNV amplitude is proportional to the degree of motivation to perform the expectancy or attentional task.)

2. Another brain region which appears essential to normal reading is an inferior posterior parietal association area which also turns out to be late-developing in man. This area seems more specifically related to the sensory integration involved in reading than to attentional control in general.

Maturation of this area has often been suggested as essential to learning to read and many recent views of dyslexia center on maturational deficits or lags (Satz et al., 1971, 1974). Investigations of relative maturity here may find localized evoked potentials most valuable and some studies have begun such a technique with good and poor readers (Preston et al., 1974).

Hippocampal theta, often related to attentional control in lower animals, may be similarly interesting in humans, although its central location in the brain and consequent difficulty in surface recording would make it seem less approachable and of lower priority in any case than the above.

Lastly, the most important direction in this area would be to relate whatever maturational index works (for either or both areas of importance) to success in reading instruction. What needs to be settled is whether dyslexia, for instance, would be avoided by delaying formal instruction until neurological development reaches some diagnostic level. Avoiding the stigma attached to early failure would be of obvious value.

I would thus place highest priority on research directed at devising techniques for assessing localized neurological development and research directed at the successful timing of instruction in terms of those assessments.

Approach 2:

The panel should view the physiological factors (noted in this section on the outline) in developmental terms as well. The maturation of patterns in spontaneous physiological activity and rhythms is an additional possible indicant of anatomical development to correlate with Approach 1.

Independent of maturational issues, however, children may differ on additional factors important to the ability to sustain attention. One item, in addition to those mentioned in the outline, would be differences in normal levels of arousal and "need for stimulation." These differences have become important in the study of hyperactives particularly but may be more generally useful. Do children differ in the amounts of stimulation they need to maintain normal arousal (and does their need change cyclically as in Program 1)? If so, normal classroom procedures may be much less successful and even aversive for some children. A half-hour quiet reading group just after snack may turn out to be nearly useless for some children in terms of their stimulation needs. We need both physiological and behavioral investigations to see if differing levels and timing of activity and pause are beneficial to problem children.

Program 3 seems related to Problem Area 3 and merits major study. Given a particular home environment, what agenda may be expected? Can the classroom be better adapted to population agenda differences? Can teachers be taught to sample these differences and use them?

Approach 3:

The goals of Approach 3 are probably the most practical, although things like Program 4 are still considered more art than science by most teachers and administrators. In that regard, how successful is (was?) the Stanford Micro-teaching system?

There is, moreover, a major question of the appropriateness of long term goals in this approach. The problem is always raised by critics of behavior modification and highly structured teaching. Simply, what is the process doing to the learner? It is not altogether clear that successful attentional management by external means is much different from the use of drugs -- either creates artificial dependencies in order to make short term advances in learning. More appropriate in either case would be systematic intervention in some way which was geared to helping the children employ attentional strategies and effort more efficiently, independently of the external environment and its conflicting demands.

Certainly an approach aimed at teaching self-control rather than environmental control is a rather optimistic goal at best and a hopeless one at worst, but its benefits in terms of the extra-school world and independent learning and behavior seem clear. It is obvious that such an approach would require maturational readiness (Approach 1) and would involve not only examining the possibility that good readers are better at state management than are poor readers (Approach 2, Program 2) but exploring the manner in which they learn to be successful at that ability.

While I freely admit the wild speculation involved, I wonder if some of the tools necessary for proper investigation and even eventually for teaching are not now being developed in biofeedback research. A research question for the future would seem to be whether we could best spend educational time and resources in external attentional management and removal of distractions, etc., or in specifically teaching children how to use and control "problem-solving states" or how to extend "concentration gradients" to sets determined by others, etc. The known physiological concomitants of such states (Approach 1, Program 2) and the feedback devices now available may prove important aids in making and implementing that decision.

Response to "Entries in a Research Program on Attention and Motivation"

Robert Hess

In response to your letter asking for suggestions about a program of research in attention and motivation, I think the most useful thing I can do is to send an introductory chapter and conclusions of a study on "engagement" that I have been working on for the past three years. We defined student engagement as "attention to the task, activity or teacher, in accordance with the instructions of the teacher." Most simply, this study is on "task" behavior which included attending to the teacher, working with peers on school tasks, working with materials assigned by the teacher or selected by the student. We gathered the data by observing and recording simultaneously certain specific teacher behaviors and the engagement or disengagement of students. One observer recorded behavior of students who were in direct interaction with the teacher; another observed students who were working with peers or with materials.

At the beginning of the study, we spent some time trying to relate some of the experimental work by Berlyne, and by Fiske and Maddi on arousal states, curiosity, and effects of varied experience, to our design and instrumentation. The first chapter indicates some of our thinking on the relevance of this work to the classroom.

We observed teachers in two consecutive years; the enclosed chapters summarize the second year of the field work. During this year, we observed fifteen teachers, a total of sixteen different times each. Observation sessions were counterbalanced by subject matter. Two subject matters -- reading or language arts and math -- were included in the design. The grade levels ranged from kindergarten through grade six. Roughly half of the students were Mexican Americans, the rest were Anglos. The school was located in a low-income area of San Jose.

The most important findings from the point of view of your concerns may be these:

1. The relatively strong impact that the classroom instructional organization has upon levels of engagement or attention. That is, although the teachers' individual behaviors do account for some of the variance, the way teachers organize their instructional activities is probably more important.

2. There are no differences among the levels of attention by sex or by ethnic group. (During the first year of the study we had Blacks, Mexican Americans, and Anglos in the study sample; no differences appeared among these groups during

this first year.) This finding means, to us, that any tendency for boys to be less engaged is easily overridden by the influence of the teacher and the school environment. The same holds for ethnic differences. I interpret this to mean that, if students from a particular ethnic group seem to be more disruptive in a given school district, it is because of the social conditions in which they live rather than strictly ethnic characteristics.

3. We found, during the first year of the study, differences among the nine schools included in the design. These differences suggest that principals, community attitudes, and other school and community influences help create an environment that is conducive (or not conducive) to attention in the classroom.

I hope this material is sufficiently clear to be useful or at least understandable. I can elaborate, of course, and can provide a full copy of the report if it would be helpful.

As for additional lines of research, I am inclined to comment on the directions our study would point to me rather than take a more cosmic view of the scene. I would suggest the following possibilities:

1. A more careful study of the sequence of teachers' attempts to arouse and maintain interest should be pursued. Although we have roughly 70,000 specific observations of teachers and students, we do not have techniques for looking at the sequential interaction between teacher behavior: student response: teacher further response, etc.

2. Our study does not include longitudinal observations of individual children to see how much, and under what conditions, the attentiveness of an individual child is related to what is going on in the classroom.

   Parenthetically, I am inclined to think of attention or motivation as a pattern of response to a given environment rather than -- or, perhaps, as well as -- characteristic of a given child. Thus, our goal was to identify the sources of variation in engagement scores of groups of students. A similar analysis could be done for individual students.

3. I would be inclined to look for indicators of the teachers', or school's, or peers' tolerance for disengagement and effects of modeling for both engagement and disengagement. I believe that a climate is created in a classroom which sanctions attention to the task or sanctions inattention. That is, there are some classrooms where attention is rewarded positively by both teachers and peers, and others

where inattention is rewarded positively by peers and negatively by the teacher.

4. A more complex kind of an analysis might be done on the phases of student attention. The first task of teachers is to arouse attention and engagement and to do so they may use novelty, surprise, etc. This tactic probably wears thin very soon unless it is bolstered by student interest in the task itself (does Hunt's concept of mismatch fit here?), and/or by a personal respect for, and perhaps attachment to, the teacher as a source of social reinforcement and as a model of interest in learning. That is, the relationship between the student and the task and the student and teacher might usefully be added to our concept of the teacher and school environment as sources of specific stimuli and as ways of organizing stimuli in the learning context.

Excerpts from: Robert D. Hess and Ruth Takanishi, The Relationship of Teacher Behavior and School Characteristics to Student Engagement, Technical Report No. 42. Stanford, Calif.: Stanford Center for Research and Development in Teaching, 1974 (draft).

This study was originally designed to identify the techniques used by teachers in their classrooms to arouse and maintain the attention and interest of their students (student engagement). During the first phase of data gathering, the conceptual framework was expanded to include the investigation of other sources of variation in student engagement. The principal influences on student engagement that were then examined were: student characteristics (sex, ethnicity, age); contextual variables (open space vs. self-contained classroom architecture, subject matter, weather); teacher attitudes (toward open space, classroom organization, control ideology); global teacher strategies (size of instructional groups, social organization of the classroom with regard to direction of student attention -- toward the teacher or toward materials or peers); and specific teacher strategies for engaging and maintaining student interest (using visual aids, personalizing, summarizing, rewarding individual achievement, and a number of other specific teacher behaviors).

The study was conducted in two phases. In the first phase (reported in detail in SCRDT R&D Memorandum No. 105), the subjects observed were 24 teachers and their students in the third- and fourth-grade classrooms in nine elementary schools in low-income communities of the San Francisco Bay area. In the second phase, 15 teachers were observed in a single school that included grades K through 6. During the year, the school moved from self-contained classrooms to a new open space building. Eight observations, counterbalanced by subject matter (four each in mathematics and language arts), were made in each architectural condition.

The major findings were: (a) teacher behavior accounts for a large proportion of variance in student engagement (estimated by regression analysis); (b) both specific and global teacher strategies are strongly related to level of engagement; (c) teacher attitudes are associated with level of engagement, but less strongly than other aspects of teacher behavior; (d) classroom architecture is not strongly related to level of student engagement, but is associated with the pattern of classroom organization and teacher-student interaction; (e) student characteristics (sex and ethnicity in particular) have little or no correlation with engagement levels;

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(f) the pattern of classroom organization (direction of student attention and instructional group size) affects engagement and interacts with classroom architecture in its effects on student behavior; and (g) there is extreme variability in both student and teacher behavior in the classroom.

These findings emphasize the significance of situational and contextual influences in the study of teacher and student behavior. They reaffirm the need to establish contextual parameters that facilitate investigation of the relationships among variables and permit identifications of sources of variation. The stability of teacher effects across quite different types of classroom settings supports the view of the teacher as the central influence on students. The findings, however, illustrate the complexity of patterns through which teacher influence may be mediated. For researchers, the results have implications for the design of studies using observational procedures to obtain useful estimates of sources of variability in teacher and student behavior.

CHAPTER 1: BACKGROUND, OBJECTIVES, AND RESEARCH APPROACH

The Problem and Objectives

Even with a sophisticated curriculum and well-designed instructional materials, teaching can be effective only if the features of the learning situation engage the attention and energy of the student. The role of attention -- which we call engagement -- as a mediating process in the teaching-learning transaction has received relatively little research effort, perhaps because it is assumed that "good" teachers and "good" curriculums naturally stimulate students. The elements of a teaching context and of teaching techniques or strategies that act to arouse interest and maintain attention, however, are separable from other features of the teaching process. It is this part of the total teaching activity that was the focus of this study.

Whatever "natural curiosity" is, it does not occur in a vacuum. Student involvement in classroom activities can be enhanced or diminished. Engagement can be reduced by a number of factors: disparity between the student's personal experience and the material presented by the teacher (as may happen with children from low-income homes or from cultures having little in common with the teacher's own background); previous aversive classroom experiences of the student which "turn him off" to school; ineptness of the teacher in relating interpersonally to the class; fatigue, peer pressure; and numerous other distractions. In effect, the teacher is competing with other attractions and pressures for the student's energy. Even in an ideal match of interest and background between teacher and student, the learning situation must have elements that attract the attention of the learner if teaching is to occur.

Stimulating and maintaining the attention of students is thus of interest to teachers in all classrooms and particularly so where attempts are being made to improve the quality of education offered to the community. If, as we assume, creating student interest will promote learning, then techniques for making the learning situation more attractive and exciting to the student will contribute to student achievement. In schools where student achievement has been relatively low, the use of such techniques and strategies may be especially important as part of the total effort to improve the educational environment.

In low-income and minority communities especially, schools have often failed to offer relevant and stimulating educational experiences that make sense to children and to which they can relate. Yet it is particularly critical that the classroom activities engage the students' interest. Some have not reached the level of accomplishment in basic academic skills, such as reading, that enables them

to use the materials typical for their grade levels. Children with unsuccessful school learning experiences, who have in boredom and frustration turned off to the school, challenge the resourcefulness of the teacher if they are to be convinced that school is a place in which it is worthwhile to invest their interest and energy. In attempts to develop more successful efforts to improve educational opportunity and achievement, the ability of the teacher to create, select, and use strategies that more effectively engage the students may be a critical factor.

In the rapid growth of new programs for minority and low-income students during the last decade, there have been many research and developmental efforts to facilitate achievement by creating new instructional techniques or curricular formats and materials. The success of these new materials, curriculums, and technology depends, in our view, on establishing classroom conditions in which they can be used. The availability of new materials and innovative methods is obviously not sufficient in itself. Attention should also be given to the social and affective context in which learning is supposed to take place. No curriculum can be effective with students disenchanted by negative school experiences.

This study was thus focused on one of the mediating processes -- engagement -- that affect the quality of teaching and learning in classrooms. Of special interest were the strategies that teachers use in low-income-area schools to engage their students and the relative extent to which these strategies are successful.

Underlying the study was an assumption that the teacher has the responsibility for establishing an effective educational environment. This assumption contrasts with the view that it is the duty of the student to attend to the teacher. We view the student as the educational consumer, selecting instruction or materials that are appealing and ignoring those that are not. The format of mass-media educational programs, such as "Sesame Street" and "The Electric Company," illustrate this approach. Motivation and interest are seen as a partial result of the program design rather than as exclusive properties of the student.

The overall approach of the study, as initially formulated, was to identify through observation the techniques and strategies that teachers in actual classrooms used to engage their students. In short, our goal was to discover what teachers did to "turn on" their students. In general terms, the objectives of the study were (a) to identify teacher strategies for engaging students, (b) to determine levels of student engagement, and (c) to examine the relationship between teacher behavior and student engagement.

Theoretical and Empirical Framework

Although a large body of prescriptive literature about teaching exists, teacher engagement strategies have not received much research attention (Maehr and Sjogen, 1971; Rosenshine, 1971). The prescriptive literature offers "how to teach" strategies based on generalizations from laboratory research, educational philosophy, theoretical orientations, and common sense, but these suggested strategies are rarely based on research on teacher and student behavior in actual classrooms. With the exception of achievement motivation, little theory and research have focused on motivation in classroom settings (Weiner, 1969). The work of de Charms (1971), Di Vesta et al. (1971), and researchers at the Wisconsin Research and Development Center for Cognitive Learning (Sorenson et al., 1970) are some of the few attempts to relate motivational theory and research to classroom teaching.

A review of theory and research on human learning, motivation, and teaching provided an empirical base for deriving teacher engagement strategies for this study. In addition, we interviewed a number of teachers about their strategies for engaging students and then drew implications about teacher behavior that might be related to student engagement. From this work, observable teacher behaviors were specified and became the basis of a Teacher Strategy Instrument.

Logically, initial student attention to the task is essential for learning. Theory and research on novelty and curiosity motivation suggest that the teacher can manipulate properties of the environment to arouse and focus student attention. Berlyne (1963) argues that situations characterized by novelty (change, surprise), complexity (amount of variety or diversity in a stimulus pattern), and uncertainty have attention-arousing properties. These situations are hypothesized to lead to a motivational state of epistemic curiosity by the creation of a discrepancy between experience (informational input) and expectation (prior learning). Epistemic curiosity refers to an inner state of high arousal that can be relieved by specific exploratory activities. Berlyne's curiosity theory is similar to cognitive consistency theory, which can be stated in terms of congruity and incongruity (Osgood and Tannenbaum, 1955), balance and imbalance (Abelson and Rosenbaum, 1958; Heider, 1946), or consonance and dissonance (Festinger, 1964). Schultz (1970) has discussed in detail elements involved in the arousal of the learner based on the creation of a discrepancy between experience and expectation.

The empirical work on curiosity and arousal suggests that there are three primary characteristics of stimuli that might have application to the design of instructional settings in which arousal and engagement are desired: stimulus variability, novelty and surprise, and incongruity. To a degree, these have been deliberately incorporated in more or less systematic ways into educational writings and practice.

Research by Coats and Smidchens (1966) suggests that variability of teacher behavior can have strong motivational effects on students. Teachers can introduce stimulus variability by using different kinds of instructional devices and materials, by changing activities within the lesson, or by changing the instructional groupings of the students.

Teachers can present stimuli that are essentially "new" (novelty), or are sudden or abrupt in appearance (surprise). Distributing sealed envelopes, each containing a different number of straws, to a class and asking pairs of students to open their envelopes, count the straws, and perform all possible arithmetic operations on the two numbers, is an instance of the use of novelty to enhance skill practice.

Incongruity is a condition in which the input is composed of stimulus elements not previously associated. For example, a teacher starts work on number bases by writing "2 + 2 = 2" on the board and asking the class "How can that be?"

These instructional applications are based on a substantial body of research indicating that discrepancy leads to the learner's arousal and that experience and expectations contribute to arousal. The reasons why discrepancies arouse the learner, however, are still a subject of disagreement (Berlyne, 1965; Mandler, 1964).

Once student engagement is aroused, it must be maintained in order to continue the learning process. If the creation of epistemic curiosity leads to sustained student involvement in learning, the discrepancy has led to a productive outcome. Habituation to discrepancy effects, however, with an accompanying loss of interest also occurs when the stimuli are constantly repeated (Davis, Buchwald, and Frankmann, 1955; Sharpless and Jaspar, 1956).

There are two implications of the habituation effect for teacher engagement strategies. First, a teacher cannot display the same behavior or patterns over an extended period of time and expect continued high student engagement. For example, if a teacher continually reinforces a child, this repetition may minimize the motivational power of reinforcement; in the Coats and Smidchens study (1966), students became habituated to a "dynamic" lecturer. The second implication is that the teacher should be modifying continually the discrepancies presented to students. Bruner (1966) has referred to this process as the pacing or sequencing of optimal levels of uncertainty. In his discussion of the problem of the "match," Hunt (1965) notes that if the mismatch (discrepancy) is too great, the learner may become anxious or withdraw from the situation or both; likewise, if the mismatch is too small, the learner will either not attend to the stimuli or become bored. Thus, Hunt considers the problem of the match as highly important in teaching strategies. The teacher's task is to find the circumstances or conditions that will continue to interest the student in learning.

This task involves sensitivity to the student's background, needs, abilities, learning sets, and interests in order to predict which cues or arrangements of cues will be most interesting, as well as when they may be most interesting.

A specific means by which a teacher can reduce an initially large discrepancy for the student is by the use of "advanced organizers" (Ausubel, 1968) or learning sets (Harlow, 1949). Both means serve to direct the learner's attention to certain features of the stimulus complex and to provide him with some structure for incorporating new experiences. Teachers can create learning sets or organizers by pointing out the goals of the task and by structuring the lesson to indicate how the task is similar to some previous or more general learning task or experience.

A challenge of mastery or competition may also maintain student interest. The desire to assert or reaffirm competence or to show oneself more competent than others (as in spelling contests, for example, or in challenges to get a task done faster and better than previously) seem to have particular motivational force. These strategies present the student with a task neither too easy nor clearly beyond his capabilities. This type of match between his known competence and the challenge has considerable motivating power. It is, perhaps, an example of White's (1959) concept of effectance motivation, which "aims for the feeling of efficacy, not for vitally important learnings which come as its consequences."

A teacher may also maintain engagement by challenging the learner with inconsistencies in his answers or by presenting him with new or contradictory evidence. This process tends to create a new discrepancy once the previous one has been resolved. In this way, teachers may be cognitive models of engagement -- modeling inquiry and exploration, asking challenging questions, and testing hypotheses. Rashid (1968) notes that the degree of skill with which teachers themselves deal with subject matter and the clarity with which they communicate this skill to children may be the basis for strong cognitive modeling in classroom situations.

Finally, informational feedback on the correctness or appropriateness of behavior is also a means of directing attention to correct responses and of increasing the probability of their recurring. Thus teachers can use reinforcement as a means of creating the feeling of competence in the student. Reinforcement can be provided verbally, e.g., "Good!" or "You're doing a great job!," as well as nonverbally, e.g., smiling or affectionately touching a child. Teachers can personalize reinforcements according to their judgments of student needs and characteristics (Lesser, 1971). They can reinforce student initiative, curiosity, and exploration, as well as provide corrective feedback.

The data gathered in classroom settings in this study were to provide a basis for testing these generalizations about teacher engagement strategies. The network of influences on student engagement is extraordinarily complex in the natural habitat of the classroom. Our results led us to try to develop a conception of the engagement process and the teacher's role in it which recognized this complexity. The modification of our approach is discussed below.

Methods and Findings of the First Phase of the Project

The project staff has completed two phases of data gathering in natural classrooms. The first of these was conducted during the 1971-72 school year; the second during the 1972-73 year. The material for this technical report is taken primarily from the 1972-73 data. Methods and results of the initial phase were reported in detail earlier (Hess et al., 1973) and will only be summarized here to provide a context for the second year of the field study and to indicate the changes incorporated in the design and procedures.

In the first year, the central goal of the study was to identify effective teacher strategies associated with student engagement in actual classrooms. Student engagement was defined as observable interest in and/or attention to a learning task prescribed by the teacher.

Observations for the first phase were made in 24 third- and fourth-grade classrooms in nine low-income-area schools in the San Francisco Bay area of California from September 1971 through May 1972. Classroom observers for the project received intensive training in August 1971 and again in February 1972. Interobserver agreement averaged around 90 percent for most categories on the instruments used.

Two observers worked as a team; one recorded the teacher's behavior on the Teacher Strategy Instrument while the other recorded student behavior on the Student Engagement Instrument, following in sequence a preselected sample of ten students. Procedures were coordinated so that observations of both teacher and students were made in simultaneous 10-second intervals (with a 10-second period for recording); one interval thus contained data on 10 seconds of teacher strategy use and 10 seconds of engagement rating and other information (e.g., sex, ethnicity, size of instructional group) on one child. Each classroom was observed eight times, twice on four different days during the school year. Each observation time was approximately 30

minutes of instruction (90 intervals) in academic subject matter. The data set contained 16,086 observation intervals of student data and 16,687 intervals of teacher data.

Data were gathered in the sample classrooms on engagement and strategy use; analysis was done separately in these two areas, and attempts were then made to link strategy use to student engagement levels.

The level of engagement was determined by the percentage of the total number of observation intervals in which the observed students were rated engaged (either receptive or expressive mode). Levels of engagement for each classroom and observation time are shown in Table 1.1. Striking intra- and inter-classroom variations are evident in these data. No differences attributable to either student sex or ethnicity were found. Subject matter effects were tested and also showed no significant differences.

Significant differences were found, however, between levels of engagement in large groups (nine or more students) and those in dyadic (one-to-one) or small groups (two to eight students). The results suggested that as the number of students in the instructional group increased, the percentage of students engaged tended to decrease (Hess et al., 1973; Takanishi-Knowles, 1973).

The sample schools differed from one another in average levels of engagement. Figure 1.1 shows the means and ranges of engagement levels in the six schools. The origins of school-to-school differences are not examined in this study. They do raise the possibility that characteristics of a total school and neighborhood could affect levels of engagement in ways not discernible through studies of teachers and classrooms.

We defined teacher strategies as overt and observable bits of behavior, such as asking a specific question, smiling, or giving feedback to a student (see Teacher Strategy Instrument in Appendix A). Examination of frequency and consistency of strategy use both among and within teachers showed that some strategies or techniques were used with relatively great frequency across all teachers while others were used relatively infrequently. As with the engagement data, variation was a striking aspect of teacher strategy use.

An analysis of a priori groupings of strategies (strategy classes) showed that teachers used more affective strategies with students in dyadic and small instructional groups than they did with students in large groups and that stimulus variation and change strategies were used more with students in large instructional groups (Hess et al., 1973; Takanishi-Knowles, 1973).

TABLE 1.1

Engagement Levels by Classroom across Observation Times, 1971-72
(Percentages)

Classroom Code	Observation Time							
	1	2	3	4	5	6	7	8
1	63	79	76	100	92	93	91	88
2	86	64	83	76	90	98	90	81
3	64	79	83	99	83	87	83	90
4	83	69	81	87	78	98	69	82
5	74	88	72	75	83	68	79	78
6	38	73	63	63	72	63	89	82
7	67	88	81	80	80	81	94	94
8	86	82	50	69	70	48	70	93
9	77	80	93	73	87	78	99	72
10	78	97	86	74	84	89	80	92
11	87	81	92	80	85	78	84	89
12	84	81	96	55	79	87	81	79
13	78	88	79	80	75	88	96	90
14	94	87	95	78	74	94	73	94
15	75	63	79	63	89	74	91	73
16	92	81	85	79	73	83	86	99
17	77	76	67	79	87	68	82	60
18	94	64	94	63	78	92	93	69
19	68	67	74	90	88	86	86	88
20	65	44	94	76	77	93	81	69
21	70	69	99	73	83	94	81	61
22	68	88	71	83	97	81	84	86
23	49	49	82	76	63	76	81	85
24	69	77	87	82	84	73	86	86
Mean	74	75	82	77	81	83	85	82
Range	38-94	44-97	50-99	55-100	63-97	48-98	69-99	60-99

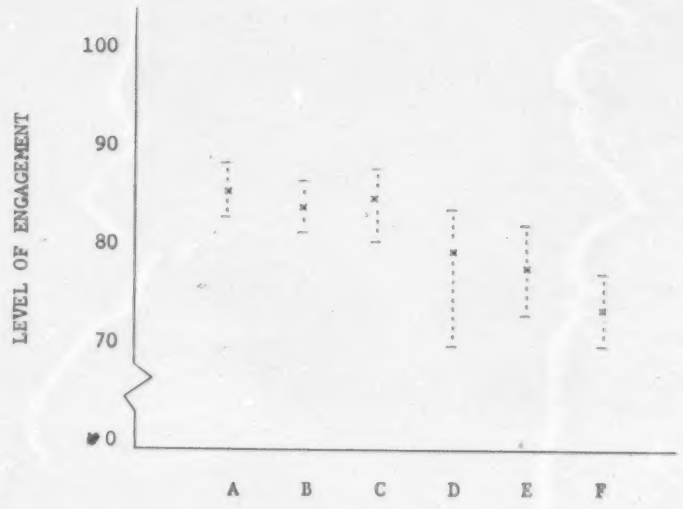

Fig. 1.1. Range and mean level of engagement by school, 1971-72.

Four methods were used to examine possible links between teacher strategy use and student engagement levels: (a) a comparison of patterns of strategies used by teachers whose classes showed high average levels of engagement and those whose classes showed lower levels; (b) a comparison of types of engagement (receptive versus expressive) associated with each strategy; (c) an examination of the tendency of teachers to teach in relatively small groups (a global strategy) as an explanation of inter-teacher differences in levels of engagement; and (d) computation of impact scores intended to show, on the average, relative effectiveness of each strategy, across all teachers, in eliciting engagement.

Morton (1973) further investigated the effectiveness of specific strategies on engagement. She conducted training sessions with two teachers that increased their use of two strategies (Personalizes Task and Rewards Individual Achievement) and observed concurrent engagement

levels of a student sample in each classroom. Her results showed that although strategy use was increased by training and feedback procedures, variability in engagement levels of students was such that no clear relationship between strategy use and engagement could be demonstrated across 5 days of observation (2 hours each day).

In summary, the results of the first year of data collection were: (a) there were large differences in level and mode (receptive or expressive) of engagement among classrooms and among observation rounds; (b) the frequency of strategy use varied among teachers and for individual teachers from one observation round to another; (c) the mean percentage of students engaged increased significantly during the year; (d) there were no significant differences in level or type of engagement by sex or ethnicity of students, or by subject matter; (e) level of engagement differed significantly by size of instructional group, with lower levels for large groups than for small or dyadic groups; (f) level of engagement in the classroom was not clearly related to the use of particular strategies; and (g) teachers can be trained to increase their use of specific strategies although it was not clear that the difference in usage affected student engagement levels.

Implications of the First-Year Data

Reformulating the conceptualization of the problem and redesigning the methods for the second year of data-gathering were the two major consequences of the first-year results. Three features of the first-phase results required explanation and further investigation: (1) there were consistent differences among teachers in the levels of engagement in their classes, suggesting that in some way teachers were having an impact upon their students; (2) there was little relationship between the frequency of use of teacher strategies and levels of student engagement, suggesting that our initial model of teacher behavior -- student response was not sufficient; (3) there was a relationship between a classroom organization variable -- size of instructional group -- and student engagement, suggesting that our model should be enlarged to accommodate a wider range of sources, specifically contextual or setting variables. The model of teacher behavior -- student response was adopted, of course, with full knowledge that other factors affected student engagement, but it was assumed that specific teacher behavior would be so influential that clear relationships would emerge despite inputs from other sources.

What are the possible explanations for the findings of the first phase? We will divide our discussion into methodological and conceptual considerations. Granted, this division is not a clear one in all cases. Methodological considerations here refer to problems in design and data collection during the first phase. Conceptual considerations refer to reformulations of the problem and assumptions that guide research.

Methodological explanations for first-phase findings include several points. One possibility is that the single observer used to record student behavior in the first phase was not able to provide data that distinguished between the students in direct interaction with the teacher and those involved with peers in work groups or working with materials on their own. Obviously, connections between specific teacher behavior during a 10-second time period and a consequent student response are more difficult to detect if some of the teacher behavior observed was directed toward students other than those being observed. It had been our assumption that there would be sufficient instances of teachers relating with the entire class to provide adequate data on direct teacher-student interaction and that the teacher's style and strategies would influence even those students not in direct exchange with her. Neither of these assumptions was well founded. The design of the second year of the study was altered to provide data on both types of students -- those in interaction with the teacher and those engaged with peers or materials.

Another consideration touching on the design and methodological aspects of the study was the problem of adequately sampling classroom behavior. The variability of both teacher and student behavior was extreme. It seems possible that such variability is so great that the usual analytic approaches for revealing correlational relationships are too limited to detect those that may exist. This is a possibility that we take seriously. The extreme variability and its implications for research in the classroom are discussed in a separate technical report.

Another methodological explanation is that the categories developed for use in observations were not subtle enough to catch the nuances of tone, temper, expectation, disapproval, and praise that the complex task of teaching requires. Some of the teacher's messages to the class are difficult to detect and our methods may have missed them. Teacher-teacher differences in student engagement appeared but effective ways were not developed to measure and record them. Discrete behavioral categories that were used as the primary measure of teacher behavior may not have captured the more global aspects of teacher influence such as attitudes toward classroom organization, control of students, and teaching.

It may be difficult to classify the "vibes" that form a part of the "mystique" of teacher effectiveness. The analysis of data in this report, however, indicates to some degree how much of the impact of the teacher, as represented by differences among teachers, can be assigned to different aspects of her or his behavior. There is a residue that remains explained but is related to inter-teacher differences. More refined data-gathering techniques and more comprehensive conceptualization may whittle away at this "mystique." We hope these findings make it more susceptible to systematic examination.

Quite apart from these matters of method and design, the findings of the first year suggested changes in the conceptualization of the engagement process itself. The original model of teacher-student interaction and engagement was one of teacher behavior -- student response. Obviously, the social dynamics of a classroom are much more complex and subtle. A more adequate model must also accommodate the history of the teacher-class interaction (Ryan, 1970; Smith and Geoffrey, 1968), recognizing that the teacher may set expectations for herself and for the students early in the term and reinforce these intermittently in ways that are not easily detected in short, limited observational periods, even though they are repeated.

It seems reasonable that a teacher has internal expectations about the level of attention she desires as well as a level below which she will not allow it to fall, if possible. It may be that within a zone of attentiveness for the class as a whole, the teacher allows some wandering of attention by a few students. If too many students become tuned out or if one or two show excessive disengagement or disruption, however, she will intervene immediately, sometimes with an emergency tactic of her own choosing. Many teachers told us that they had extreme measures that they used when things threatened to get out of hand, usually some technique on which they could always rely. The technique's effectiveness, however, depended to some extent on surprise and infrequency of use. Such occasional but extraordinary methods, even though effective, would not appear in the analysis of a group of teachers; individual variations were part of the potency of these methods. Also, a teacher might find that on a given day, for various reasons, the techniques she used in more routine situations were different than on a previous day; again, aggregate data tend to disguise these patterns. Teachers have a repertoire of techniques to draw on, and interviews with them suggest that the versatile teacher may pick different tactics to suit different occasions or to adapt to different classes. These techniques are not readily examined in systematic ways, even with the massive amounts of observational data collected in this study.

Another interpretation is that, in addition to specific teacher behavior, more molar or global factors significantly influence the level of student attention. Contextual variables, such as physical arrangement of the classroom, size of instructional grouping, weather, and the like act directly on the students and on the teacher as well. This explanation is consistent with the data obtained during the initial year of the study.

The design for 1972-73 was constructed to permit more systematic examination of some of these possibilities. Teacher attitudes were tapped by several devices; contextual features and student characteristics were sampled over a greater range of variation. Methodological improvements were made, primarily by adding a third observer. This gave more precise information about the direct teacher-student interaction. By good fortune we had the opportunity to observe in

a school that planned to shift from self-contained classrooms in trailers to a new open-space building in midyear. This shift also allowed an increase in the total number of observations, treating the self-contained and open-space conditions as separate studies with similar research designs. Data were available from teachers and students at grade levels from kindergarten through sixth grade. The design permitted more precise comparisons of the effects of subject matter (reading/language arts vs. math). The composition of the student body -- about half Mexican-American and half Anglo-American students -- afforded a more adequate examination of the influence of ethnicity on both teacher and student behavior.

The second-year design thus utilized a more comprehensive model, permitting analysis of more components that might contribute to variance of student engagement. Several serious problems remained, but the more complex design yields information that should be useful to researchers designing studies of classroom teacher-student transactions.

The design of the study's second phase was based on a view of the engagement levels of students as related to several different sources of variation. These variables include: teacher attitudes (toward classroom control, open space, etc.); teacher global instructional strategies (size of instructional group, distinction between students in interaction with the teacher and those oriented toward peers or materials); specific teacher strategies (represented by the teacher observation instrument); and contextual variables (weather, subject matter, open-space versus self-contained rooms); and student characteristics (sex, ethnicity, age, or grade level).

This design draws upon a model of the engagement process as influenced by the school environment and offers the opportunity to identify multiple sources of variability and to study teacher influence in the context of different instructional settings. Thus, teacher and student behavior can be studied within different instructional group sizes or classroom types as well as across settings. The design in this way more accurately reflects the complex and changing dynamic of natural classroom interactions.

CHAPTER 6: SUMMARY AND CONCLUSIONS

The conclusions we draw from this study follow both from the questions originally incorporated in the design and also from unexpected features of the data that impressed us in the course of our analysis. The questions raised in the study were related to the attempt to identify sources of variation in student engagement in the classroom. Since the clusters of independent variables included in the regression analysis (see Chapter 4) accounted for very large proportions of variance in some of the problems (up to 77 percent; see Table 4.8), the summary of results is organized around this topic. Particular attention is given to the teacher as a specific source of influence.

The major findings of the study are as follows.

1. Teacher-teacher differences account for the largest percentage of variation in student engagement. The amount of variation attached to teacher-teacher differences changes from one setting to another but these differences are clearly more significant in their total impact than any other source of variation.

   There is the possibility, of course, that the unique combination of students in these particular classes also contributed to the differences between teachers. Perhaps these might properly be called between-classroom differences. Several aspects of the data, however, argue against this explanation. First, the specific and global strategies teachers use in the classroom are related to engagement levels across different observation periods. Second, teacher attitudes appear to explain much of the teacher-teacher variance, leaving roughly 10 percent not identified or explained. Some of this variance might have been accounted for by other specific teacher strategies -- only 10 of the total of 27 were used in the regression analysis. Some of the variance might have been related to attitudes, if they could have been measured more systematically and in depth. Third, data are available from the teachers who participated in both years of the study. Although they had different classes during these 2 years and reported to us that there were large differences from one year to the next in the effort required to maintain attention, the mean levels of engagement in these different classes during the 2 years were almost identical. These arguments do not entirely dismiss the possibility that random classroom differences may explain some of the variance among teachers, but the contribution from this source seems not to be as great as the influence of individual teachers.

At this point we believe that teachers have their own individual "zones of comfort" of student attentiveness and that they establish expectations about what is permitted and what is not. Students may "tune out" temporarily in some classes and display some disengagement without concern on the part of the teacher; in other classes, students learn that even small signs of inattention will trigger a response from the teacher. Teacher-teacher differences, then, may reflect both variations in ability to engage students and variations in the level of attention demanded by the teacher.

2. The specific strategies that teachers use in direct interaction with students are related to engagement levels. This relationship between teacher behavior and student engagement was, of course, the initial question of the study. The impact of specific teacher behavior varies from one strategy to another and from one setting to another, but clearly what teachers do through their specific techniques is related to the engagement levels of their classes. This result is similar to findings based on the data of the national longitudinal study of Follow Through, which indicate teachers' instructional techniques account for a large percentage of the variance on specific skill criteria (approximately 25 percent) over that attributable to student ability (Cooley and Emrick, 1974).

3. There is no easily defined pattern of high- or low-engaging teachers; teacher uniqueness and individuality are evident despite large differences in effectiveness. Although some specific strategies seem to be associated with high levels of engagement across teachers, it seems likely that individual teachers have their own patterns. In short, there are several different ways to successfully engage students. Strategy profiles of successful teachers show marked differences one from another; profiles of teachers whose students have low levels of engagement also show striking dissimilarities (see Table 6.1).

4. Level of student engagement is strongly related to the global strategies teachers use in their classrooms. This is one of the clearest and perhaps most important findings of the study. Our original model of teacher behavior -- student response was based on a conception of the teacher and her specific instructional behavior as the central source of influence on student behavior. Our data, however, have led us now to believe that classroom organization and the use of global interactional strategies may be even more important in influencing engagement levels.

   The two global strategies we examined were instructional group size and direction of student attention (toward the

TABLE 6.1

Strategy Usage for Two High-Engagement Teachers (10 and 15) and Two Low-Engagement Teachers (7 and 9) by Architectural Condition (Percentages)

	High-Engagement Teachers				Low-Engagement Teachers			
	Self-Contained		Open Space		Self-Contained		Open Space	
Strategy	10	15	10	15	7	9	7	9
U.Vis.A.	35.4	21.6	47.4	39.0	46.9	39.2	50.4	20.6
Moves	34.0	52.4	16.9	48.6	32.8	46.5	23.9	37.5
E.Man.M.	18.7	27.3	9.7	20.6	6.6	2.1	2.8	-
Chg.Act.	4.3	4.1	2.6	3.6	1.6	.6	2.6	.6
Surp.	2.4	12.9	-	1.5	-	-	-	-
Sts./Expl.	23.4	40.2	51.5	37.7	37.4	57.9	46.1	61.0
Comds.	26.6	41.9	23.5	38.6	20.2	20.0	22.2	26.0
Sums.	10.4	11.0	20.1	19.9	13.9	11.8	19.9	11.6
P.Tsk.	1.5	4.5	5.7	1.9	6.9	1.9	.4	.1
Orients	5.8	2.0	6.0	8.9	3.7	.3	3.2	4.2
Choice	1.0	.1	-	.1	-	-	-	-
Pers.	69.8	70.1	57.2	74.5	63.5	67.6	74.7	85.8
Listens	46.1	47.8	50.1	63.0	50.1	49.9	68.5	67.5
Smiles	2.6	16.0	1.0	15.2	9.4	2.4	8.2	.8
R.I.A.	8.6	15.2	4.7	11.4	4.2	.4	7.5	.3
Touches	1.4	5.5	.4	4.7	3.7	2.3	2.2	1.0
A.Suc.	1.3	.6	.6	.6	1.2	.9	.3	.1
Displ.	2.4	1.7	1.3	2.8	6.7	12.0	4.6	8.8
Con.Pers.	.4	.1	-	-	1.2	1.7	.3	.4
Con.Tch.	-	.3	-	.3	.1	.4	.3	.8
Quest.	37.9	44.1	45.0	40.0	46.3	37.8	44.4	31.9
G.Fdbk.	21.2	16.4	9.7	19.9	16.3	18.4	17.5	22.1
Chall.	5.4	2.9	.8	4.6	4.2	4.0	4.2	4.0
F.Comp.	6.4	3.5	1.0	5.3	.1	-	5.4	-
Tests	5.6	-	3.5	-	-	.1	-	.1
G.Con.Fdbk.	.1	-	1.3	-	.3	-	1.3	-
Adm./Man.	2.9	2.8	1.3	3.9	3.0	1.3	1.3	.7

Note: Percentages are averages of strategy use within intervals across periods.

teacher or toward materials and peers). Both of these strategies have strong relationships to student engagement and are also related to the operation of other variables. If one wanted to change both teacher and student behavior, it would be more effective, we believe, to manipulate the global aspects of the instructional setting rather than to instruct teachers in new specific teaching techniques. The features of the educational environment, especially the patterns of interaction between students and teachers, may be more productive areas of change.

5. The attitudes that teachers hold toward certain aspects of the teaching environment are associated with student engagement levels. This part of the study was developed and measured in less specificity and depth than some others because the teacher attitudinal instruments were intended to measure change in attitudes toward open-space classrooms rather than to explain variance in student engagement. Nonetheless, teacher attitudes toward the physical and organizational environment in which they teach show a significant relationship to engagement and contribute to the variance even after specific and global teacher strategies have been entered into the equation (see Table 5.5). The attitudes that most consistently relate to engagement are those toward open space and toward the degree of formality in classroom structure. It seems likely to us that a more systematic measurement of teacher attitudes toward aspects of informal classroom structure such as student movement, interaction, and choice of activity would show more substantial contributions to the variance in student engagement levels.

6. The association of any specific teacher behavior or attitudes is modified by the situation in which the instruction takes place. More specifically,

   a. The association of instructional group size with engagement is markedly different for Teacher-Directed situations than for Material/Peer-Directed situations.

   b. The percentage of variance accounted for by teacher-teacher differences varies from self-contained to open-space conditions.

   c. The association of a specific strategy (such as Rewards Individual Achievement) with engagement varies from self-contained to open-space conditions.

   d. The association of specific teacher strategies with student engagement is very different in Teacher-Directed than in Material/Peer-Directed situations.

e. The relationship of teacher behavior to engagement in Material/Peer-Directed situations changed when the classes moved to open space. That is, the mean level of engagement did not vary so much as did the relationship between teacher behavior and engagement in these settings.

f. The relationship of teacher attitudes to student engagement in Teacher-Directed situations decreases from self-contained to open-space classrooms; the contribution of attitudes to engagement in Material/Peer-Directed situations increases in open space.

The interaction between specific teacher behavior and the contextual features of the instructional setting makes it difficult to argue that there is an ideal pattern of teacher strategies or techniques that will be successful in engaging students in all settings. Our data make it apparent that teachers strongly influence their students' engagement levels. They do not do so by using a relatively stable pattern of behavior that they have learned will work across a variety of situations. It is not a consistent style. Rather, teachers seem to adapt their behavior to new situations (as indicated by the changes in strategies used in open space as compared with self-contained classrooms). In short, although teachers affect student engagement, the process through which their influence is mediated is very complex and is linked to the demands and opportunities of a given instructional setting.

7. The move to open space from self-contained classrooms is related to teacher behavior and patterns of student engagement but has little relationship to overall levels of student engagement. A primary reason for selecting this particular school for the second year of the study was the evidence from the results of the first phase suggesting that classroom organization and other contextual variables might have stronger influences on student engagement levels than did the teachers' specific techniques. Since the school planned to move from self-contained to open-space school architecture, it seemed to offer an opportunity in which the impact of change in physical organization on classroom behavior would be obvious and perhaps dramatic.

The effect on overall level of student engagement was minimal (mean level, All Directions, for self-contained classrooms was 82 percent; mean level, All Directions, for open space was 83 percent). There were consequences of the move, but they appeared in the engagement pattern of different situations within the classroom. Engagement levels in Teacher-Directed situations rose (from 86 percent to 91 percent); levels of engagement in Material/Peer-Directed situations dropped (from 76 percent to 72 percent). The move to open space did apparently affect teacher-student interaction. The proportion of

dyadic interactions between teachers and students increased from roughly one-third to about one-half; the proportion of interactions with large groups decreased by about the same amount. Classroom architecture, at least in the first few months after the move, had a complex pattern of relationships with the behavior of both students and teachers. As a source of variation in student engagement, however, classroom architecture had only modest impact.

8. Teacher-teacher differences in student engagement are moderately stable across different classroom and instructional settings. The rank order of teachers in terms of mean levels of engagement in self-contained classrooms is significantly correlated with their rank order in open space for both Teacher-Directed and Material/Peer-Directed instructional settings. When both types of engagement are combined, the rank order correlation is highly significant (Rho= .85, $p < .01$). This stability in rank order is significant despite the small differences in mean levels of engagement among several of the teachers. Seven of the fifteen teachers were between 90 and 93 percent, for example, in mean level of Teacher-Directed Engagement in self-contained classrooms; nine were in this range in the open-space setting (Table 5.2).

9. Student engagement levels during the two years of the study are relatively independent of the sex, ethnicity, and age (grade level) of students. This finding is based on observations of 39 teachers and their classrooms. During the first data-gathering phase, classrooms included Black, Mexican-American, and Anglo students, with a few students of other ethnic groups. Examination of ethnic and sex differences for both years showed little difference in engagement levels or in frequency of disengagement. We conclude, then, that it is the environment of the school and of the community and the relationship between school and community rather than the ethnicity or sex of students that are responsible for the extent of engagement or disruption in the classroom.

Implications for Research on Teaching

Importance of Classroom Organization

The implications of our findings on classroom organization are among the most important and most useful of the study. Only two types of organizational patterns were identified for observation, but they are of interest in themselves and suggest that other forms of social patterning in the instructional setting may also shape the interaction

between the student and the classroom environment in ways that affect his attention and perhaps his ease of learning.

To summarize our most important conclusions about size of instructional group and direction of student attention:

1. Students are more engaged in small instructional groups than in large ones.

2. The relationship of the size of instructional group to student engagement varies with the setting. (Group size does not apply to students in Material/Peer-Directed situations.)

3. Students directed toward the teacher are more likely to be engaged than are students directed toward other students or toward materials on which they are working alone. This is especially true of boys and in open-space settings.

4. Disruptive disengagement (as contrasted with passive disengagement) increased in Material/Peer-Directed situations -- from 4.4 percent to 11.1 percent (see Tables 3.1 and 3.2).

These classroom organizational effects are related to one another and to other features of the total context, such as architectural condition. All of these are linked to the teachers' use of specific strategies in ways that cannot be completely unravelled, given the design of the study.

A paradigm for research on teaching should take seriously the interaction of setting or context with teacher and student behavior. Our results indicate that the search for relationships between teacher and student behavior in vacuo can lead to only partial understanding or none at all. Generalizations of the findings must be referenced to the specific instructional setting. Thus there is a need for developing appropriate techniques for measuring critical environmental and situational variables that are at least as reliable, valid, and precise as those techniques that now exist for measuring individual variables (Cronbach and Gleser, 1957).

Future efforts in the development of the theory of and research in teaching must take this work into account. More effort is needed in the characterization and measurement of educationally relevant features of the classroom social and physical environment and the interrelationships of these features with teacher and student behavior.

Issue of Variability in Classroom Observational Data

Another aspect of the data that carries some implications for research design is the variability of observations of both student and teacher behavior. Almost all facets of the data -- frequency of

strategy use, level of classroom engagement for a given observation period, teachers' use of a particular global strategy such as size of instructional group -- show relatively great variability from one observation period to another. Moreover, the amount of variability, as indicated by the regression analysis or analysis of variance, changes from one architectural condition to another. For example, behavior in open space is less variable than in self-contained classrooms.

This variability in ratings or in indices that originated in observers' check marks is to some degree a product of the variability of the rating and recording process -- the less-than-perfect agreement among different observers and less-than-identical judgments made over similar events by a single observer. The relatively high agreement among observers in the study, however, suggests that much of the variation in both teacher and student behavior is a feature of the behavior itself, not merely measurement error. If this is so, the unevenness in the data presents severe problems for the researcher who is pursuing evidence of relationships between teacher behavior and student response. One example of the consequences of extreme variability in levels of student engagement is that the number of measurements needed to establish that teachers differ in their ability to engage students is obviously much larger than would be needed to establish teacher-teacher differences in more stable types of behavior. The variability in the data of the study and its implications for research in the classroom are discussed in a separate report and are only noted in passing here. The problems created by variability, however, have something in common with the difficulties psychologists face in the study of personality (Fiske, 1974, 1973) where lack of specificity in the definition of concepts and behavior (following primarily from reliance on words) and the nature of the data establish limits on the progress that can be made.

Multivariate Approach for Research on Teaching

The analytic approach employed in this study enabled us to assess the contribution of several clusters of variables to the dependent student variables with which we were concerned. A multivariate approach is more appropriate for the analysis of the complexity of the teaching and learning process as it exists in the natural classroom.

Implications for Educational Practice

Teacher Training

The results of this study indicate that teachers differ in their abilities to engage students in learning. Specific teacher strategies

were also found to be related to levels of student engagement. Together these conclusions might suggest that teachers can be trained to engage students more effectively. Two cautionary points, however, need to be considered in the design of teacher-training programs for the purpose of influencing student engagement.

Morton (1973) attempted to train teachers to use selected specific strategies for the purpose of affecting levels of student engagement. Teachers were observed and their effective strategies for engaging students were identified. A program of training was designed to increase the use of these specific strategies. Ten students in each classroom were observed for 2 days after the teachers increased their use of these strategies (Personalizes Task and Rewards Individual Achievement). Although Morton showed that teachers can be assisted to change or at least to increase the use of specific kinds of behavior in the classroom, this change did not appreciably increase the average level of student engagement. To be sure, the variability in student behavior was such that it would be difficult to detect average increases in engagement on a relatively short term basis; long term effects might emerge. Her data do not make this a likely interpretation, though it remains a technical possibility. Thus, the results of Morton's study indicate that although teachers can be assisted to identify effective engagement strategies and to increase their use, this does not necessarily lead to higher levels of engagement.

In addition, we have already noted that teachers who are high engagers have individual, perhaps unique strategy profiles in the classroom. Although there are some similarities (necessarily, since use of specific techniques correlates with level of engagement), there are many individual teacher differences. Likewise, patterns of strategy use differ among teachers who are low engagers (see Table 6.1).

These two considerations do not lead to recommendation of special training programs to assist teachers in developing skills for engaging students in their classrooms, at least not with respect to specific instructional and management strategies. If it is true, as these data indicate, that the relationships of specific teacher behavior to student engagement cannot be predicted in advance without knowing something of the parameters of a particular instructional setting, training teachers in specific teaching skills (Borg et al., 1970), while ignoring the context which may support or limit their effectiveness, may miss the mark. On the contrary, these findings suggest the manner in which the teacher arranges the social environment of the classroom can potentially optimize the effectiveness of her specific techniques and her students' engagement. Thus the planning of classroom settings can be one of the teacher's most potent strategies in influencing her students' engagement. There is a great need, then, to develop teacher skills in classroom social organization which parallel those developed for teacher skills in questioning and explaining.

Teachers might find the results of this study useful in two ways: first, the information about the effects of global strategies, such as direction of attention and group size, the relationship of physical environment to teacher behavior, and the lack of ethnic and sex differences in student engagement would provide information that experienced teachers would be able to use in their own ways. This could increase their confidence in their own resources and help them select approaches compatible to their circumstances.

Second, on the basis of our experience with teachers in the study, we are convinced that teachers can make better use of information and feedback about their own behavior than they can make of training programs designed to change teacher behavior in predetermined directions without consideration of classroom contexts or obvious individual teacher differences in behavior.

Evaluation of Teacher Effectiveness

Our discussion of the implications of the study for teacher training is related to political pressures for the evaluation of teacher effectiveness. The findings of this study suggest caution in the evaluation of teachers based on existing research on teaching. While the findings indicate that teachers can be held accountable for their instructional behavior (see Cooley and Emrick, 1974), there is not likely to be a universal set of behavior which for every teacher is related to student behavior. Furthermore, the instructional purposes and setting must be taken into account in examining linkages between teacher and student behavior. Clearly the observation of teachers for the purposes of the evaluation of their effectiveness involves procedures which require further development.

The Open-Space School

The findings of the study also have some implications for classroom and building planning. These results are conceivably of interest to principals as well as teachers, since the planning for social organization of the school and, to a degree, of the classroom is a matter of joint concern.

The move to open space from self-contained units was the major organizational change in the school in which the second year study was conducted. A great deal of preparation had been made for this move: the school was planned, architecturally, by a committee that included teachers and parents. The move thus was anticipated and, for the most part, desired by the community and the school staff.

In summary, the most important results of the move to the open-space school were:

1. The overall relationship to student engagement was minimal. Architectural condition accounted for some variance in Teacher-Directed Engagement but virtually none in Material/Peer-Directed.

2. The move was related to the pattern of engagement -- Teacher-Directed Engagement increased; engagement levels in Material/Peer-Directed students declined.

3. Teachers tended to use large-group instructional settings less often in open space (about a third of the time), than in self-contained classrooms (about half of the time) in both Teacher-Directed and Material/Peer-Directed situations.

4. The move to open space was related to the teachers' use of several specific strategies. Some of these changes are apparently directly related to the physical arrangements of the classes in the two conditions. Teachers tended to use Moves less and Listens more in open space. This represents the shift from a setting in which the teacher moved around the room among students to one in which the teacher established a "teacher station" to which students came with questions and problems (see also Resnick, 1971).

5. The use of Disciplines as a strategy declined slightly in open space, suggesting that the greater visual and spatial freedom did not create more problems of classroom management.

6. The experience in open space was a positive one for teachers, and their attitudes toward it became increasingly favorable within the few months after the move.

7. The impact of classroom social organization was increased by the move to open space. In self-contained classrooms, the difference between engagement level in Teacher-Directed and Material/Peer-Directed situations was 10 percent (86 percent vs. 76 percent). In the open-space condition, this difference was doubled (91 percent for Teacher-Directed and 72 percent for Material/Peer-Directed).

Although this is a relatively positive report on the shift to open space, it needs an important cautionary note. Our data come from the period of initial experience with the new setting for these teachers and students. The school moved from self-contained portable units to the new building in March, and we conducted our observations within two months after the move. These data, then, represent the first phase of response to open space. Informal evidence, principally from conversations with teachers, suggest that the adaptation to open-space architecture may take place over several months and that both faculty and students increase in their ability to use it effectively. We

guess that attitudes will become more enthusiastic and that the initial caution on the part of some teachers will disappear.

Our purpose is not to make recommendations about the advisability of open space as a choice for schools and communities. There are other considerations to be taken into account. One of these is the degree of pre-planning and inservice training that teachers and staff receive before moving to an open-space school. We believe that the positive report on our sample school was a consequence of the preparation on the part of teachers and principal to enter the new school. Given these necessary cautions, our conclusions may be helpful in evaluating the potential effects of open space on student engagement and teacher behavior.

Research in Low-Income Schools — A Proposal for the Future

This study began with a concern for the quality of education provided in schools serving students from minority and low-income backgrounds. One implication of our two-year study in these schools was the recognition, supported by our data, that low-income schools are not homogeneous entities which can be characterized and dealt with in similar ways. Whether they serve low-income or middle-income families, schools differ from one another in the quality of education provided to students.

What makes for school-to-school differences in the engagement and achievement of students? This is a question researchers have attempted to answer for some time. What the study findings strongly suggest is that to understand academic success and failure it is necessary to go beyond the individual teacher and her classroom to the social organization of the classroom and of the school and its staff, and to their relationships to the community in which the school is located. Using the methodology of an ethnographic case study, Rist (1972) argues that the social milieu of the school, which is represented by the values and behavior of teachers and administrators, affects the environment of the classroom and hence the educational experience of the students. The quality of administrative leadership, the professional ideology and expectations of the teachers for the students, and the support system for the teaching activity by the teacher's peers and administrators interact to produce qualitatively different social milieus which may contribute to school-to-school differences in engagement. Hence, the third phase of the study, were there to be one, would extend the cluster of variables to include school districts and local schools in the existing design. It would also probe more systematically to provide an empirical basis for the correlates of school-to-school differences in student engagement.

Response to "Entries in a Research Program on Attention and Motivation"

Arthur Blumenthal

The fundamental goal, specified in the paper at the outset, is lines of research to help in the classroom teaching of reading. I find that some of the suggested programs in your outline are much better suited than others to that goal. Also, the goal implies the ordinary problem of teaching reading, rather than the peculiar abnormalities that crop up in acquiring literacy. The latter could call for somewhat different goals and research, i.e. different types of medical-therapeutic intervention.

My general reaction to the problems of teaching normal readers is that the task is fundamentally one of encouraging nature to take its normal course, very much as in the case of initial language acquisition. That is, the human biological system is constructed with the capacity to perform these skills. Of course, many things can delay, distract, or interfere with this normal function, as with other complex skills. Hence, the task of teaching reading is, first of all, to provide a fertile environment that encourages the development of the reading skill.

General Comments on the Outline

1. The relationship between attention and motivation might be better specified. On the surface, it would seem that motivation is the more crucial variable in acquiring literacy (as in acquiring all skills), and that attention follows naturally in the highly motivated learner. It could be that attention and motivation are, in a cognitive-process sense, inseparable. The control of attention is the control of motivation; motivational acts are attentional acts. In a word, they are different sides of the integrative process of cognition.

2. Regarding research aimed at innovations in reading instruction techniques, I recommend a rereading of Mathews' Learning to read, historically considered. Almost all our experiments on teaching techniques (special teaching alphabets, phonics systems, machine instruction, etc.) have been tested and applied in various forms since educators began keeping records on such matters. Each time a "new" orientation to reading instruction is introduced, there is a temporary improvement in learning to read. That is, this field is unusually susceptible to Hawthorne effects, and that means there is considerable danger of wasting NIE funds on spurious innovations.

Today there are many sources of influence that might lead in this negative direction. For example, highly technical advances in theoretical linguistics might be borrowed to dress up some old programs with a new terminology, at great cost. However, the net advance in the art of teaching as a result of these advances is often zero. Moreover, there are certainly other theoretical-science and engineering-science sources for deceptively innovative programs.

Reading instruction has been particularly vulnerable to these distortions because of the professional inferiority complex that has plagued elementary education in modern times. At conferences on the problems of teaching reading, it is common to find no one present who has ever taught anyone to read, let alone someone who has become highly sophisticated in this art.

3. A related problem here is the borrowing of technical jargon from other areas, often a very positive and useful development when the new terms lead to a clearer understanding of some phenomenon. However, in terms of funding, the following question must always be asked: Does the new terminology buy anything or is it mere substitution of "Y" for "X"? The simple words "teaching" and "learning" have been disguised in innumerable ways in technical expressions, with no net gain. Catchy new technical phraseology may sell fast, but may just as easily founder on hard realities.

4. Beware of isolating the study of reading skill too much from other skill studies. The general skill-and-performance literature is a fruitful place to find metaphors. (See work on music, general psychomotor, and game-playing skills.) Compare what we know about these skills and teaching them. Examine highly successful cases of skill instruction in other areas (e.g., the Suzuki method of violin teaching).

Some Specific Comments on the Targeted Problem Areas

PROBLEM AREA 1. (Helping teachers to estimate optimal environments)

Why not encourage programs to identify the most sophisticated and successful teachers of reading, then learn what they are doing and what their needs are? Perhaps these teachers are more sensitive than anyone else to the fact that children differ in the kinds of environments they can use. These teachers may also be more sensitive to fluctuations in a child's attentiveness and motivation. Also study carefully the personality characteristics of the good teacher, and ask the following question: given a good reading teacher, how much, if any, difference results in change of educational technique or form of textual materials?

What might the psychologist supply to sophisticated reading teachers that they won't pick up through special sensitivities? It is likely that we could give them useful information on rest-activity cycles and on the effects of stress-distraction on attention (Broadbent-type work). However, there are many pitfalls in introducing such discoveries as physiological optics, theoretical linguistics, or electroencephalography. Also, the use of the "new linguistics" is sure to go the way of the "new math." It is true that modern linguistics has recently led to a better understanding of the English spelling system and has shown it to be more systematic than formerly assumed. This knowledge may be useful to the reading teacher, but again I would cite the history of teaching reading and argue that this advance in orthography-linguistics would have only a trivial impact on the level of literacy in the general population.

The above discoveries and related areas of science-technology are very expensive. Should NIE be funding them in view of more immediate and critical needs in reading instruction?

PROBLEM AREA 2. (Uses of texts)

The particularly important thing to be added here is the examination of the effect of textual content. A child who is fanatically interested in airplanes, dinosaurs, or whatever may acquire literacy most rapidly when initial reading instruction is based on these intense interests. Interest may be the crux of the whole attention-motivation matter. Imagine reading instruction based on maximal flexibility; here there might be a "content bank" where the introductory reading materials are rewritten in all the likely topics of childhood interests. Then the child's interests could be identified so that appropriate materials might be selected.

I would also give priority to research comparisons of differences of all types between skilled and unskilled readers. These differences have been frequently investigated over the past 100 years, but bear continual examination and interpretation. The reasoning here is based on past successes, in my opinion, some of the best results of reading research have come from these types of comparisons.

You are right in noting that schools teach reading in a peculiarly stereotyped way, but I suspect that sophisticated teachers are subverting the system and introducing more flexibility.

PEOBLEM AREA 3. (Social-Cultural milieu)

I believe that this area could be elaborated as extensively as the previous two areas in your outline. Elaboration would involve bringing in various categories and techniques of social-cultural research. For example, by examining the history of literacy, one can see how literacy levels in societies vary independently of technology, the physical characteristics of schools, knowledge of

linguistic theory, and other factors. The ofter-cited example is the 19th-century Cherokee nation, where literacy among children was nearly 100 percent; it seemed almost impossible to prevent a Cherokee child from learning to read! The social-cultural forces underlying that phenomena are by far the overriding factors in literacy and therefore deserve priority attention from NIE.

Perhaps NIE could support some historical investigation to examine in detail the social-cultural variables controlling literacy levels. The public could then at least be informed of these variables, and some social programs might be set up to encourage the positive ones.

Response to "Entries in a Research Program on Attention and Motivation"

Jerome Kagan

The central problem in reading failure occurs during the opening years of elementary school. There is also good reason to believe that the reasons for failure to master reading skills during the first few years are not the same as those responsible for low scores on reading achievement tests in adolescence. Thus my comments will be limited to the early period of learning.

The Relationship Between the Reading Problem and Cognitive Skills.

My interpretation of the existing literature, complemented by personal work conducted last year, makes me skeptical of the hypothesis that the major cause of reading failure in primary school children is a functional or organic impairment, deficiency, or lesion in the central nervous system. The work of Shankweiler and Liberman 1972), as well as others, suggests that most children classified as poor readers can identify letters, read some words, and even read many sentences.

The crux of the problem seems to be difficulty in mastering a handful of diphthongs (ee, oo, eu, oi, ou, au, ie, ei), a handful of double consonants (ch, wh, th, pn, lk, fl), reversals of vowel-consonant pairs (er, re, ir, ri), and correct pronunciation of certain internal vowels (especially the short o or short a). There are other errors, but these tend to make up the bulk of the mistakes children make when they are learning to read. Incidently, confusing p, d, q, or b is not a common error and a recent paper by Sidman in Child Development indicates that children with reading problems can distinguish between these forms.

It is not at all clear why some children should have inordinate difficulty in recognizing and correctly pronouncing the diphthongs and consonant pairs in question. The problem seems to be an inability to parse correctly the syllables of words that involve these symbols.

An important study would be to locate a large number of elementary school children with reading difficulty and a group of controls, matched on important demographic variables, who are not having difficulty. First, one could administer a battery of reading tests to determine the specific problems each child is having in reading performance. Second, one could individually administer a battery of tests presumed to measure each of the major cognitive processes that might contribute to the reading problem. These tests would measure the ability to (1) distinguish visual and auditory patterns, (2) analyze visual arrays, (3) integrate both auditory and visual

information over time, (4) operate on information in short term memory, both visual and auditory, (5) make inferences from partial visual and auditory information, and (6) memorize and recall, from long term memory, arbitrary associations between visual symbols and auditory sounds.

The tests would also measure the extent of reflection and impulsivity shown by the subjects, and the willingness or lack of willingness to guess when one is unsure.

Careful examination might reveal a relationship between the specific reading problem displayed by the children and the profile of performances on this battery of tests.

Attention and Motivation

I hold the general and popular view that attention is the final common path in reading, but that many separate factors influence the attention process. It is assumed that if children were able to sustain focused attention on the reading material and the teacher's instructions, they should have no trouble learning to read. We acknowledge that the enigmatic process of attention is influenced by fatigue, drugs, central nervous system lesions, anxiety, and motivation. By motivation we mean that children have an internal representation of a desired goal or state of affairs. Motivation to read means that children hold a valued representation of a level of skill they have not yet attained.

Because reading is an arbitrary skill with minimal value for many children, we assume that many children are motivated to read in order to obtain other goals, most notably, to gain praise and approval of parents and teachers, to avoid their reproof, and to be like their valued adult models (the identification process).

It would be useful if one could demonstrate or disprove the above idea. A relevant investigation would involve evaluating the motivation toward these goals in both reading and nonreading children, to determine if the profile of motives is different for each group. One reason this study has not been performed in the past is that there is no consensus on valid procedures for assessing motives in children.

A technique we have considered during the last 3 years assumes that children's long term recognition memory for their personal verbalizations on motives covaries with the hierarchical organization of those motives. A possible experiment to test this idea involves interviewing groups of readers and nonreaders of elementary school age in a way that permits the interviewer to provoke the children into uttering sentences that describe their motives regarding teacher and parent approval and disapproval, identification with parents, hostility, dependence, and peer acceptance. The investigator then

extracts from the tape recordings produced by each child 10 to 12 statements related to each motive and records these statements on tape. Two to four weeks later the individual children listen to 100 statements, only half of which they actually uttered. The children are asked to indicate which of the sentences they said during the earlier interview. The analysis seeks to determine whether there is a differential profile for readers and nonreaders for the motivational areas studied.

Reflection-Impulsivity and Reading Ability

A number of limited studies suggest that impulsive children tend to make more errors in reading than reflective children. This hypothesis should be either confirmed or disproved once and for all. If confirmed, it is reasonable to argue that impulsive children should be trained to become more reflective, since remedial programs to instill a reflective attitude have been successful.

Individual Remediation by Tutoring

If attention is the central problem in reading failure, and most problem children can read some words, it seems reasonable to conclude that classroom conditions guaranteeing closer supervision of children's attention would be therapeutic. Several people have suggested that if first grade children who showed any signs of a reading problem had an individual tutor for 10 hours a week, the incidence of reading failure would be reduced considerably. Informal experiments of this type have been tried at various schools throughout the country and the results support this idea.

It seems to be time for a serious empirical test of this hypothesis. The recommended procedure calls for testing a large number of kindergarten children (perhaps 1,000) for knowledge of letters, general vocabulary, and short term memory. From this large group, one would select those who scored in the bottom third on all three tests, for these are the children likely to have difficulty in learning to read. This group is then divided in half into pairs, matched on demographic and intellectual variables.

The experimental children would receive one-to-one supervision by high school students or adults for 10 hours a week in the classroom during the entire first year of school. The control children would receive no special attention. Reading ability would then be assessed at the end of the first grade, to determine if the individual tutorial help was useful.

Readiness and Maturation

There is reason to believe that some first grade children, perhaps 10 to 15 percent, are not yet at the stage of development where they are reliably using the cognitive strategies that make reading

easier. Some theorists regard the use of these strategies as dependent on a maturational process variously called the "five to seven" shift, the stage of concrete operations, or the period of executive functioning. This idea should be confirmed or disproved.

A possible study involves administration of a battery of tests to 5- and 6-year-olds, to learn whether they possess the abilities of the more mature stage of functioning. The tests would include the ability to operate on information in short term memory, eye-hands test, delayed auditory feedback, conservation, ability to plan, and perhaps other tests. The children who are not "through the stage" would be divided into matched experimental and control groups. The latter would have normal classroom instruction; the former would receive no instruction in reading or arithmetic during the first year of school. The delay in instruction should help children who are not yet through this maturational period, are not ready for reading instruction, and are thus made anxious when pressed to read. One would assess reading ability 2 years later at the end of the second grade.

Summary

The most promising areas of priority include: (a) studies to clarify why children have special difficulty with diphthongs, double consonants, and short vowels, the primary stumbling blocks for the majority of children; (b) studies of the role of motivation in reading; and (c) testing the hypothesis that one-to-one tutorial attention is helpful for kindergarten children who are likely to have difficulty in reading.

APPENDIX II

Acquisition of Literacy in Normal Children
by Betty Bryant

Teacher Development
by Eugenia Kemble

Acquisition of Literacy in Normal Children

Betty Bryant

The following set of research proposals concerns ways that normal children can acquire literacy, which is viewed here as a central positive value within a general life style in which writing and reading skills are embodied. Literacy is explicitly or implicitly an essential dimension within contemporary American society. In order to comprehend and "cathect" text, the readers must use imagination such that the sets of expressed relationships are represented in their minds.

Several assumptions are central to these research proposals:

1. One important dimension of children's preliteracy training consists of being read to by adults or competent siblings, within the context of the home and before entering school.

   Another important but complex and hard to define dimension of preliteracy training is affective-imitative in nature; according to this dimension, books and reading are highly valued, and parents have a "cathexis" in them. We assume that in many middle-class homes this training begins and is continued several years before children encounter the school system.

2. This more or less informal training (Scribner and Cole, 1973) has a powerful influence on children's attention (engagement) and motivation to read in the formal school situation. The reason is the peculiarly intense affective relationship of the children to the parents and older siblings who introduce them to the reading process.

3. Traditional models of the educative process assume that when the complex of discriminative stimuli in the home are similar to those in the school, transfer of the particular attention-motivation skills acquired in the home situation will transfer readily into the classroom situation. In the case of middle class whites that is, indeed, the typical state of affairs. However, the attention-motivation skills engendered by preliteracy training are not typically acquired by lower class Blacks.

4. Whether children are White or Black, lower or middle class, their self-systems do manifest themselves automatically in the classroom situation. According to Sullivan, the self-system is a learned cognitive-affective organization with a complex set of skills, attitudes, and behaviors that

facilitate adaptation to the environment. This self-system is developed from birth in interactions between parents and children. With the onset of language, development of the self-system shifts from sensory-motor and affective interactions, and arises from verbal interactions.

The self-system is highly resistant to change at all stages of development, insofar as the "cost" of change is anxiety or loss of equilibrium; the self-system will and must defend itself against intrusions that threaten its integrity, stability, and equilibrium (i.e., it is stable and conservative, and thus resistant to intrusion or further re-organization).

It is clear that within Sullivan's conception motivation-attention to specific aspects of the environment is both a function of and a component of the self-system.

5. When a child's self-system embodies preliteracy, the school situation is structured such that the next steps -- the acquisition of attentional-motivational skills leading to literacy -- are made easy and virtually guaranteed. Given the structure and mission of the schools, the relative absence of preliteracy skills within a child's self-system sets the stage for a "mismatch" and a subsequently unhappy relationship between the child and the system.

Research Proposals

The first proposal is for a home-playgroup preliteracy research project. Essentially, mothers of children aged two and a half to four or five years old will meet within the format of a discussion group. They will be systematically trained in the substance and technique of preliteracy training, i.e., how and what to read to children in the home. Questions of major interest are:

1. What are the mothers' theories or notions or conceptions about literacy and their own personal roles in preliteracy training?

2. What literacy-related linguistic and cognitive changes are effected in both mother and child during the course of the training experience?

3. What emotional and attitudinal changes occur?

The research design for this undertaking should include, at a minimum, the following components:

1. An interview schedule to assess pre- and post-training motives and attitudes of the parents toward literacy and preliteracy training. Questions included in the interview would tap such domains as the parents' values and aspirations for their

children in terms of reading and writing, their views of who is responsible for particular aspects of this training at specific points in the child's life, and their expectations of their child's adaptation to the school situation.

A number of investigators such as Coleman (1966) have found that lower class Standard English-speaking parents have relatively high aspirations for their children in terms of the attainment of literacy and other areas of accomplishments they view as spinoffs from literacy skills.

2. An observation schedule to identify various strategies and the degree to which they are used to translate motives into action appropriate to preliteracy training of the child. This area is one in which we could see a mismatch between stated values and behaviors directed toward the achievement of these values. For example, Cazden and her associates (1972) interviewed parents of preschoolers in the Roxbury community (Boston) about their preferences for the language spoken by teachers. A large majority of the parents expressed a desire for teachers to use standard English, and spoke at length on the value of this form of the language, while admitting that they spoke Nonstandard Black English to their preschool children in the home.

   It would be interesting to obtain parents' perceptions of why they think this situation exists. Cazden et al. did not ask this question, but parents' speculation or introspection on why they speak Nonstandard Black English yet want their children to learn Standard English would yield interesting data.

3. A well-worked-out parent training procedure that focuses directly on preliteracy skills, and carefully controls the level of complexity of the behaviors in which parents are to engage with their children. Previous mother-child intervention programs have never made preliteracy training the explicit focus of the program. In these programs, the mother-child interactions take place around toys, books, games, and materials found in the home or made by the mothers.

   In this research project mothers will be taught explicitly to engage in a specific set of behaviors around appropriate books with their children. An interesting aspect of the proposed research project is that we can teach adults to read children's books for the purpose of reading them to their children. Children's books have not been used with adults in the past because of the stigma of reading "childish" material, and because the content of the material was perceived irrelevant to adult lives.

4. Any number of measures and procedures already in existence for assessing changes in complexity of language structure and use (see Brown's A First Language analyses of the language of Adam, Eve, and Sarah across time). Also see Labov's procedures for tapping the ability of lower class informants to code-switch between Nonstandard Black English and Standard English, depending on the formality or informality of the situation.

Additional research efforts on young children's preliteracy skills are suggested as follows:

1. Develop an experimental program to help children grasp the idea that written words communicate because they represent spoken words. We could devise single character representations for action words. For example, a single character written on paper or blackboard might tell children that it is time to change activities if they wish, or that it is time for cookies. Such a simple code could be developed to the point where teacher and children could communicate with one another by leaving messages or exchanging symbols. Various games and other situations could be created to provide practice in this activity.

2. Study the effects of teaching young children the names of letters on their rate of learning letter sounds. There is a suggestion that children taught to say the letter names by rote experience more difficulty learning the sound-symbol correspondence of the alphabet than those who have not been subjected to such teaching.

3. Investigate the notion of using large muscle activity in learning prereading skills. For example, to teach the idea that printed words communicate, cards with verbs such as run, jump, laugh, and scream could be used. (There is general consensus among nursery school teachers that these are salient activities.) Children take turns choosing and displaying a card that tells the others in the group what action to take.

Resistance to change is an extremely complex phenomenon, but can be neatly described by the generalization of Denneberg that, "Organization inhibits reorganization." By definition, an intervention treatment attempts to provide an ongoing stable self-system with a complex of attitudes, skills, and behaviors either not currently a part of the system, or not well developed there, in the interviewer's judgment.

If the subject is willing to learn the "new" organization, there will still be resistance to change, because much of the self-system and its defenses are not under the direct control of voluntary

cognitive processes. However, the individual adopts the new organization and its attendant behaviors and skills at some level of integration into the self-system, since that system is not totally impervious.

The problem becomes how to evaluate the new behavior system in children and adults. First, if on any given day in the course of an intervention treatment all subjects were asked to perform certain tasks that were part of the treatment, there would be variation among the subjects in degree of proficiency. This discrepancy could be construed as the first level of "testing." Successive levels of testing would take the subjects progressively farther away from the context in which the new system was being taught, until the "situation of testing" was quite removed from that in which the training was carried out.

What I am suggesting is that there may be too great a leap of abstraction from place, people, and situations in which treatment takes place to those in which evaluation takes place.

Testing for the purpose of evaluation usually takes place under conditions that are psychologically dissociated from the learning situation. This situation, added to the nature of testing in general, puts the subject under stress and probably generates more anxiety than our fragile measures can tolerate and still get at the level of performance of a child on a specific task. In other words, evaluation procedures may profit from a design that begins with a fairly context-bound evaluation and progressively becomes more context-free. There are many ways in which this freedom can be accomplished. Older children and adolescents can be great sources of data about how they evaluate their own levels of competence on certain skills.

What we need are research designs that would allow us to look at the history and/or development of the capacity to operate with the new system of behavior among contexts of varying degrees of abstraction or distance from the context in which the new system was initiated.

Resistance also may be related to degree of engagement or nonengagement in particular activities related to the "new" system of behavior. That is, it is easier to engage a child in an interesting activity on the 10th day than it is on the first day if resistance is a factor in nonengagement.

Finally, with very young children (2 to 5 years) it is sometimes difficult to ascertain whether the resistance to learning is in the child, the parents, or some combination of both, inasmuch as the dynamics of the self-system are largely unconscious and it is difficult to separate those of the parents from those of the child.

Further research efforts that might yield information on resistance in preschool children to preliteracy training are as follows:

1. Study the amount of engagement of preschool children to the teacher when a story is being read, rather than being recounted orally. In this situation, engagement may be considered eye movements. That is, how much time do children spend looking at the teacher in either condition? Group size and length of text as well as content, can be varied.

2. In the open classroom environment (which characterizes most preschool programs), study the amount of time individual children freely choose to spend looking at books either alone or with peers. The interactions of interest here are those free from adults' intervention, where the teacher does not initiate, extend, nor terminate the activity. Such a study would give information on quality as well as the quantity of such interaction (e.g., turning pages as opposed to pretending to read the book).

3. Study preschool children's imaginative play constructions when the teacher introduces the theme: "Let's play school. Now you be the teacher, Mary." While many teachers use such a technique to find out children's perceptions of the adults in the preschool environment, it would be interesting to see how many children incorporate the more obvious literacy-related activities of the program into their imaginative play.

A series of research questions may be asked around the cross-age tutoring paradigm:

1. Study the effects of adolescents tutoring younger children selected by kindergarten, first, and second grade teachers as either potential or actual slow achievers in reading. We suggest several variations of this type of experiment: (a) high and/or low achieving adolescents may be matched with one or more younger children, or (b) teachers and parents or others in the community may be employed as tutors.

2. Regardless of the personnel used in the tutorial situation, data on the younger children should be collected on changes in the following: (a) general linguistic awareness, and specifically in phonological segmentation, (b) vocabulary, (c) oral reading ability, and (d) attitude about reading.

3. Study the notion that in adolescent-younger child tutorial situations, the older child gains more in reading skills than the younger child. This nostrum has become part of the cross-age tutoring folklore and should be systematically investigated.

4. Develop and study various motor-training procedures in reading, as well as several management models. This study

would clarify two other generally held opinions about cross-age tutoring. These are (a) the success or failure of these programs rests largely on sensitive handling of the adolescents' training, and (b) teachers of neither the younger children nor the adolescents have been cooprative with such ventures in the past.

5. Controlling for race and Standard English speech, locate those children who are both highly successful and noticeably unsuccessful in acquiring literacy. Study family and peer characteristics and relations to determine the best set of predictor variables.

6. Do an archival study on the history of Black literacy in America. Such a study has never been done, and should help researchers gain perspective on the total process of acquiring literacy. The results of this study would be made available to the general public.

7. Study the attitudes, feelings, and beliefs that poor readers of all age groups hold about writing and reading. Interview questions could be constructed to tap these "theories." Data on the match or mismatch between children's theories of appropriate behavior relevant to the literacy process and data on behaviors known to ease the acquisition of literacy would be very instructive for teachers.

8. Study children's theories of how (or if) writing and reading skills are relevant to other areas of school life, as well as life outside of the school situation. Here the general question of interest is: What assumptions do children make about the transfer of knowledge across situations?

Teacher Development

Eugenia Kemble

Teacher morale and the personality styles it engenders in the classroom are factors that affect student engagement. This paper will attempt to describe a range of contextual circumstances or pressures that probably affect both the way teachers perform and in turn the level of their students' engagement. Naturally, we cannot fit all teachers into the framework of a single descriptive model; individual differences exist or may develop among teachers as they progress through various stages of their careers. The research proposed here will look at different stages of teaching in terms of commonalities. The research will also define both the contextual factors behind those similarities and the kinds of experimental support systems that might cause generalizable changes.

In order to consider experimental changes in systems, based on measures of change in teacher behavior patterns, it is first necessary to identify those patterns in terms of existing conditions. The general idea might be expressed roughly in terms of three hypothetical stages of teacher development: (a) an initial entry stage characterized predominantly by floundering and trial and error; (b) an adaptability phase marked by "getting to know the ropes" and learning how to cope; and (c) a more stabilized, experienced phase in which some teachers tend to fall into repetitive patterns of teaching style.

We must also consider the high exit rate of teachers from the profession — especially when the demand for teachers is great and thus the risk factor in leaving is low — since it calls attention to important attitudinal factors related to teacher mobility.

The following discussion is simply for purposes of roughly drawing the idea of teaching stages. The research design to be developed might describe any number of stages, depending on what existing or future research data show. This design should not be construed to mean that all teachers fall into the stage pattern described. Instead, the design is an attempt to describe common experiences in the progression of a teaching career — such as factors in the preparation of teachers, or the pressures they face in a school setting. An analysis of these experiences may permit some generalization about teachers as a group. It is important to note that the number of stages put forward here is not so important as what they indicate about causal conditions.

I. Entry Stage: The Beginning Teacher

Most context factors relevant to the way new teachers approach their jobs concern preservice education and training. It is well

documented (Broudy, 1972; Conant, 1963; Dreeben, 1970; Koerner, 1963; Smith, 1969) that, among the professions, teachers are subject to less rigorous preparation. Education schools tend to have lower entry requirements than liberal arts colleges, and education departments within liberal arts colleges are generally thought to be easier than others. Frequently teachers in training receive less in the way of a broad liberal arts background, and often even the liberal arts subjects they do study tend to be concentrated in the social sciences.

In addition, most education schools do not have research arms, and those that do rarely require that all prospective teachers receive research training (Dreeben, 1970, pp. 128-129). The length of the training period is short and usually the field experience requirements for teachers are both inadequately supervised and unsatisfactorily woven into the total preparation program.

Lack of integration and breadth characterizes many aspects of the preservice experience. For example, teachers may study courses that supposedly instruct them in how to teach reading; they may be exposed to a few commercially developed programs or a limited range of techniques. However, they may never have to confront the entire scope of approaches known or the variety of educational philosophies that back up those approaches. Furthermore, few states have demanding certification mechanisms to help insure that all teachers experience a preparation of range and scope. For the most part, graduation from an approved education school or program constitutes certification (Koerner, 1963, pp. 118-158).

In the end, what results is a lack of rigorous training. The fact that many education students are part-timers, combined with the general inadequacy and fragmentation of the training program, tends to produce what Dreeben calls a lack of "collegiality" among teachers. Because endurance and struggle are not as much a part of teacher preparation as they are of prelaw or premedical training, teachers tend not to hang together as much or have as great a feeling of professional solidarity (Dreeben, 1970).

If these are the conditions -- and there are many more that should be included here -- what are the teaching styles and states of mind that result? It is, after all, these styles and attitides that will be most crucial to the student engagement we are trying to examine.

Most teachers tend to approach their initial teaching period with the feeling that they are inadequately prepared to do the job. Inasmuch as they know very well that getting into teaching requires less than getting into any other profession, their first year of school experience is often characterized by feelings of insecurity and fear. Or those people with higher aspirations may make less emotional investment in such uncertainty by simply regarding the whole experience as something to tide them over until they can do

something better (Dreeben, p. 126). Both groups may think of teaching during the first year or two as simply an art for which one either does, or does not, have the gift. These teachers are really reflecting their disrespect for education schools and, by extension, themselves. If teacher training amounts to very little, they think, then teaching must not be something to train for. Such attitudes may lead to a belief that their ability as teachers is not perfectible, revealing an underlying lack of professional self-respect. The vacuum created by the lack of a research tradition in most education schools complements the low estimation of beginning teachers for the perfectibility of their teaching.

Dreeben's "collegiality" idea applies again here. Most teachers come from the fragmented experience of the education school into the equally fragmented experience of school teaching (Dreeben, p. 52). They sense that whether they succeed or not will be based on the "givens" rather than on what is to be learned; this feeling may lead them to "go it alone" in trying to teach. Many new teachers are afraid to ask their colleagues for help, doubting that to so would really pay off.

II. Adaptability Stage: Approximately 1 or 2 Years into Teaching

As teachers move into teaching for a longer period, the primary determinants of the education school experience give way to the adaptive influences of the school setting. Teachers begin to modify their teaching styles to meet the demands of the school, and this phenomenon is probably at the heart of the relationship between context factors and teachers' ability to engage students.

Professional isolation continues. For the most part, the teacher's school day is spent within the confines of a single classroom with the company only of the children. Working with children all day is an intensive, exhausting experience. Those breaks that do come are hardly viewed as a time for professional consultation, since they are needed for simply reviving one's energy. Intensity also contributes to teachers' desire to get out of the school building as soon as the day is over. Thus, teachers rarely have an opportunity to consult professionally with one another (Dreeben, p. 52).

Lack of collegial support is complicated by lack of administrative support. It is a rare principal who will spend time giving educational advice to teachers. Administration is viewed in this country as primarily a function of rating and evaluation. (In Great Britain, in contrast, the administrative role is educationally supportive.) Teachers see administrators as punitive people rather than as helpers, a fact that is encouraged by the inadequacies of inservice education (Broudy, 1972, pp. 40-41). These two factors, lack of both administrative support and of good inservice education,

tend to reinforce the idea that teaching is not a job that can be perfected (Broudy, p. 65).

Another connecting factor that adds to this phenomenon is the degree to which teachers have responsibility for choosing those materials they will use in the classroom. Their freedom to make these choices, and the number of choices available to them, quite naturally affects their sense of control over what they do and therefore their morale as professionals.

A whole range of causes -- everything from the adequacy of school funding to the nature of a particular school's administration and organization -- influence the ability of a teacher to select and use materials in the classroom (Smith, 1969, p. 25; Broudy, 1972, pp. 41-42). The choice of resources may be limited, for example, by the decision of a school's administration to use a single program or a particular combination of programs in the first grade. If an administration mandates the use of Distar, and an individual teacher is committed to open classroom techniques, a teacher's ability to engage students is bound to be modified by the mismatch of program to teacher.

Teacher morale may be further diminished by administrative and public pressures related to standardized test performance and/or the adoption of new programs or untested teaching styles. The ever-present test pressures become even more burdensome for teachers in areas where most of the students come from debilitating socioeconomic backgrounds. When this situation is combined with the tendency on the part of desperate school administrations to use the latest education fad in hopes that it will raise test scores, teachers, who must act as the conveyors of these decisions in the classroom, frequently become cynical and demoralized. This sad fact is particularly true when the new program is brought in and teachers are told to begin using it without ever receiving adequate training or preparation on the specifics of the program or how it should be implemented. Unfortunately this is often the case.

Other aspects of teaching itself -- as distinguished from the type of school administration and the degree of teacher responsibility -- have negative effects on teachers. One has to do with the intellectual aridness of the school day. It has already been noted that teachers function in isolation from other teachers. All of their emotional and intellectual energy is focused on clusters of children sequestered in individual classrooms. Rare contact with colleagues to discuss issues or even classroom material is bound to have manifestations in the classroom performance of teachers (Dreeban, pp. 52-53).

Another factor is the number of children with whom a teacher must deal. In the elementary school this factor is important simply

in terms of class size, whereas in secondary schools the total number of different classes and different children is also important. (Note that conclusive research may or may not exist on the relative importance of class size to student achievement on standardized tests. However, class size is certainly important to the perceptions teachers have about their own situations and therefore to their ability to function well.)

We must also note that much of what teachers must do has little to do with teaching. It is common practice in school systems throughout the country to have teachers do as much paperwork as possible, along with playground, bus, lunch and lavatory duty, and similar work (Smith, pp. 24-25). Such practices are bound to influence both the teachers' professional self-concept and their classroom practice.

Not to be overlooked is parental and community pressure, a variable that has had a growing impact on teachers in the last 5 years, particularly in urban school systems, where the frustrations of the poor have been increasingly concentrated on the schools (Smith, pp. 96-97; Dreeben, pp. 75-77). There are several sociological and political reasons for this development, and they are too complex to discuss here. However, the main outcome has been a tendency to make teachers the scapegoats for a variety of social ills, and to focus simplistically on the seemingly "easy" aspects of a teacher's job, such as the existence of class preparation periods in many systems. These aspects are seen as evidence that teaching is simple and teachers are therefore getting paid too much.

There are at least two teacher characteristics that are important to this discussion of school factors bearing on the adaptability stage of teaching. One is the predominance of females in teaching, particularly at the elementary school level. The other characteristic is the common socioeconomic class origins of most teachers. These factors inevitably influence teachers' perceptions about their mobility, as well as their estimations of the importance of a career compared to raising a family (Dreeben, pp. 24-25, 58).

These, then, are some of the most important context factors influencing teachers during the "adaptability stage" of teaching. In relating them to student engagement, we must now speculate on how such context factors translate into teacher style and morale. There is a continuum between many of the attitude and morale factors to be discussed here and the ones focused on in the "beginning teacher" stage. With some of them, the simple naming of the context factor is almost sufficient to suggest the behavioral outcome.

As has been suggested, most of the context factors described above have a general tendency, particularly in urban settings, to drag teachers into patterns of coping that influence their ability

to perform at an optimum level in the classroom. It is difficult to pin down the exact ways these conditions, and the attitudes they may tend to produce, relate to specific classroom actions on the part of teachers. At best, we can hypothesize on what the general attitudinal results of conditions are, and we can assume that these results have varying impacts on the way teachers teach and students engage. We can then come up with experimental support systems to make the adaptability stage of the teacher's career more positive developmentally. But first, how do the context factors we have just described as a part of the adaptability stage affect teacher morale?

The continuing isolation of teachers from one another during the period in which they are adjusting to the hard realities of school life probably feeds any feelings of insecurity and helplessness that they may already have. Some individuals may see the lack of institutionalized sharing among teachers as a clear indication that they must make it either on their own or not at all. This lack may also encourage people to view teaching as a highly individualized style of operating, not to be touched by the experience of others. Naturally such postures may result in a tendency among teachers to stick to approaches they know well, to avoid experimentation, and to react to the advice of others with skepticism and resentment.

The punitive rather than supportive role of the principal only confirms the initial inclination of teachers to make their own decisions about classroom practices. Any admission they might offer that they are in the dark could easily be used by the administration as supportive evidence in negative rating procedures. The cumulative effect of the isolation factor and the punitive definition of administration is to increase the fears teachers have of admitting their own failings, of seeking help, and of trying new techniques (Dreeben, pp. 57-64).

Lack of resource availability and limited choice in using resources causes intense resentment and frustration among teachers. They are well aware of the injustice of being held responsible for classroom performance when they have little to say about choice of texts, materials to be used in supplementing texts, and other key decisions (Broudy, p. 43; Dreeben, p. 60).

In many systems, teachers may see the need for a particular teaching aid but are unable to convince the administration of its value. Or teachers may judge the materials they are using to be worthless and may resent the fact that they are unable to select others. Such frustrations ultimately affect their own enthusiasm for teaching, since they have little control over what they do.

Negative attitudes are magnified when teachers realize the unimportance of many of the things for which they have responsibility. All of the various administrative duties, that many teachers must

face, such as bus and hall duty, serve only to further diminish professional self-concept and morale.

Tests and their attendant parental and public pressures inevitably have a rigidifying effect on teachers. Parental awe of standardized test results, and public pressure on teachers to raise those results no matter what, make experimentation with new teaching styles or enthusiasms about new approaches risky at best. For example, the inconclusive performance of children from open classrooms on standardized tests, combined with genuine parental suspicions that such programs cannot educate since they constitute "more play than work," have discouraged many an enthusiastic teacher from trying informal approaches in New York City schools. Teachers eager to try open classroom but dissuaded from doing so by pressures like these will probably approach whatever they are allowed to do with diminished interest.

On the other hand, really good teachers with a grasp of where a class is moving may be destroyed by the insistence of the administration or school board that they use some other approach.

The weight of parental opinion in situations like these suggests to teachers that their knowledge is not respected very highly. Since it is outside forces, not professional judgment, that determines what goes on in the classroom, their confidence, drive, and sense of professional control are likely to be seriously shaken. Undoubtedly these problems, along with those already described, will take their toll in classroom behavior, student-teacher interaction, and ultimately engagement.

Class size factors and teacher isolation simply add boredom, feelings of inability to cope and passive acceptance to the list of attitudinal results related to variables in the school context. They may also contribute to teacher frustration, resentment, unwillingness to share or be influenced by other teachers, and many other behavioral outcomes previously suggested.

The sex and socioeconomic attributes of teachers — the fact that the majority in the elementary schools is female and that most teachers are recruited from the middle class -- undoubtedly affects their self-perceptions as teachers, their mobility or stability in teaching, and other aspects of their careers in ways too complicated to hypothesize about here. These factors do need to be noted, however, in any serious research effort dealing with teaching and school context factors.

III. Experienced Stage: Coping or Exit Phase

Teachers with approximately 5 years of experience probably do one of three things in relation to the school context factors that

work to shape them. First, they may continuously battle the school system for the professional right to do in their classrooms what they wish. Second, they may learn to cope with existing pressures and adapt their behavior to meet system-defined needs. Or they may leave the teaching field. Until recently, with the tightening of the job market and rising unemployment, the last alternative was widely chosen.

In looking at what teachers actually do at this stage of their professional development, both in the classroom and in terms of their career decisions, the same context factors apply as were described under the "adaptability stage" of this discussion. However, now we begin to see a more cumulative effect. At this point teachers are becoming more defined as professionals with a given style and a particular outlook toward teaching. Or they may be thinking about mobility out of teaching into other careers with more status.

One important variable to add to the cumulative effect of all the others that have been discussed here is the fact that there is virtually one school-based avenue of upward mobility for teachers, and that is into administration (Dreeben, pp. 50, 171). Since administrative jobs are rarely identified with educational expertise, the ability to move into them rarely has anything to do with teaching skill. This fact serves as a long-standing commentary to teachers on the value of teaching as related to status. It also acts as a perpetual reminder to those with ambition that teaching is a good thing to get out of (Dreeben, p. 126).

Teacher salaries are important here. The salaries of teachers compared to those of other professions (not to mention those of school administrators) have a bearing on their professional commitment and their willingness to continue reexamining classroom approaches and teaching styles (Dreeben, p. 171). Besides, reexamination is hardly rewarded in most schools. Because they are not educational leaders, few principals are able to cope with, much less encourage, a diversity of teaching styles among their staffs. Hence the experienced teachers may tend to conform to whatever pattern of teaching has become the norm in a given school or system. It is also true that conformity to the wishes of the administration tends to be rewarded; favors bestowed upon teachers by principals (and there are many informal mechanisms in schools for doing so) are usually the result of long term adherence to a particular administration's "rules of the game" (Broudy, pp. 40-43).

The dull sameness of school organization patterns and the way teachers fit into them may also take their toll on teacher creativity. The grade breakdown, for example -- the fact that a second grade teacher may never benefit from an indepth exposure to either first or third graders -- may dull teachers' perceptions on child development or even make them somewhat fatalistic about what happens to

the second graders who leave at the end of the year (Brown, p. 42). The fact that most schools are oversized, and most teachers isolated within them, adds to this tendency.

If these factors, plus those already indicated, affect experienced teachers, the question then becomes one of determining how they influence the teacher's approach to the job and in turn to students. As we have already mentioned, all assertions in this direction must be hypothetical and somewhat general. It is impossible at this point to attempt to relate specific teacher attitudes or behaviors to specific classroom strategies. It is useful, however, to attempt to come up with those things a teacher is likely to feel as a result of these factors. We can almost assume these feelings are likely to affect classroom performance in generally positive or negative ways.

Ambitious teachers who see little status reward in teaching will probably either try to get out of the field, or will lead a somewhat unhappy existence if forced to remain there. Those with lesser aspirations who stay in teaching are likely to see their more ambitious colleagues being siphoned off into administrative posts, a phenomenon that is bound to influence their view of teaching and ultimately of themselves.

Salary factors inevitably have an impact on the self-concept of teachers, and on their willingness to stay in the job if a more lucrative offer is available. The money angle also causes resentments among teachers that their work is not appreciated by an unknowing public. All of these factors may lead, in turn, to a tendency to view teaching as a transitional job or, if no alternatives are available, as something to settle into and make the best of.

(We must also note here that the increase in teacher organization and militancy during the last 10 years has undoubtedly had an enormous impact on virtually all the factors mentioned in all three stages of teaching development discussed. The change has been, however, in terms of the degree of influence of each of the factors, rather than whether a given context variable can be removed from consideration. For example, even if teacher salaries have risen as a result of organization, the question is really whether they have risen relative to other professions. They have not; in fact they have barely remained the same compared to police officers and firefighters. If teachers have more choice in selecting materials, is that choice meaningful when compared to the amount of control the principal has? In other words, the systems factors discussed here are important to the morale factors suggested, regardless of the growth of teacher organizations and their impact on educational systems.)

What we are posing here is a hypothesis about the way school system factors influence teachers over time. We assume that such influences will be translated somehow into the way teachers deal with their students in the classroom, how they engage students in the learning of reading, for example. Refining these abilities or translations into specific behavioral components is virtually impossible at this point. Perhaps the best that can be done is to come up with some notion of how engagement correlates with some of the system factors described here, and then to try a variety of system changes (mainly along the lines of teacher support mechanisms) to see whether or not the engagement measurements improve.

It seems obvious that to intervene with support mechanisms would make the most sense during or before the "entry stage" of teaching, and during the "adaptability stage," when teachers are beginning to settle down to school life. This means doing something about teacher training (preservice) and providing inservice developmental support. The idea of teacher internship, modeled after the medical intern idea, is one possible preservice improvement mechanism. The teacher center is an inservice support system that could have an impact on teachers during their "adaptability" phase.

An internship program could be designed to effect changes in attitudes that arise from the present failings of teacher preparation. Essentially an internship program might provide that all prospective teachers fulfill at least 1 year, or possibly more, carrying a partial load of teaching combined with part-day consultative and/or class work. Such interns, unlike student teachers, would be paid for their work. An internship program could go far to help establish "collegiality" among teachers, and to develop a sense among prospective educators that teaching must be learned through rigorous, long term training that combines academic background with on-the-job experience supervised by professionals.

The teacher center support service could focus on diminishing teacher isolation by providing a place where teachers can go to share ideas and consult one another. It could be a place to relax, to get away from school pressures, or to find materials that might be helpful in the classroom.

A good center could provide teachers with a choice of resources and a consultative service on how to use them. It might give high level inservice training in the form of minicourses or indepth consultations. Such a center might provide a supportive link between the preparatory education school and the public school experience of teachers, since there is no reason why colleges and public school systems could not cooperate in both the development and use of teachers' centers.

These two concepts -- the internship and the teachers' center -- could be directed at only some of the systems factors discussed earlier. Other system changes should also be tried. However, these two concepts are already reasonably well developed and could be initiated with relative ease. This fact makes them particularly worthy of consideration.

REFERENCES

Abelson, R. P., and Rosenbaum, M. J. Symbolic psychologic: a model of attitudinal cognition. Behavioral Science, 1958, 3, 1-13.

Atkinson, R. C., and Shiffrin, R. M. Human memory: a proposed system and its control processes. In K. W. Spence and J. T. Spence (Eds.), The psychology of learning and motivation: advances in research and theory. New York: Academic Press, 1968, 2, 89-195.

Ausubel, D. Educational psychology: a cognitive view. New York: Holt, Rinehart and Winston, 1968.

Baratz, J., and Shuy, R. (Eds.). Teaching black children to read. Washington, D.C.: Center for Applied Linquistics, 1969.

Berlyne, D. E. Motivational problems raised by exploratory and epistemic behavior. In S. Koch (Ed.), Psychology: a study of science. Vol. 5. New York: McGraw-Hill, 1963.

Berlyne, D. E. Structure and direction in thinking. New York: John Wiley, 1965.

Bickford, R., Berger, L., Brimm, J., Allen, B., and Gose, E. Compressed spectral array (CSA): a pictorial EEG for clinical application. Electroencephalography and Clinical Neurophysiology, 1973, 34, 750.

Bjerner, B. Alpha depression and lowered pulse rate during delayed actions in a serial reaction test: a study in sleep deprivation. Acta Physiologica Scandinavica, 1949, 19, Suppl. 65, 93.

Blake, M. J. F. Temperament and time of day. In Colquhoun (Ed.), Biological rhythms and human performance. New York: Academic Press, 1971, 109-148.

Borg, W. R., et al. The minicourse: a microteaching approach to teacher education. Beverly Hills, Calif.: Macmillan Educational Services, 1970.

Bransford, J., Barclay, J., and Franks, J. Sentence memory: a constructive versus interpretive approach. Cognitive Psychology, 1972, 3, 193-209.

Broudy, Harry S. The real world of the public schools. New York: Harcourt, Brace, Jovanovich, 1972.

Brown, R. A First Language: The Early Stages. Cambridge: Harvard University Press, 1973.

Burch, N. R. Augomatic analysis of the electroencephalogram: a review and classification of systems. Electroencephalography and Clinical Neurophysiology, 1959, 11, 827-834.

Cazden, C., et al. Making it and going home: the attitudes of black people toward language education. In Courtney Cazden (Ed.), Language in early childhood education. Washington, D.C.: National Association for the Education of Young Children, 1972.

Coats, W. D., and Smidchens, S. V. Audience recall as a function of speaker dynamism. Journal of Educational Psychology, 1966, 57, 189-191.

Cole, M., Gay, J., Glick, J., and Sharp, D. W. The cultural context of learning and thinking. New York: Basic Books, 1972.

Coleman, J., et al. Equality of educational opportunity. Washington, D.C.: Government Printing Office, 1966.

Colquhoun, W. P. Circadian variations in mental deficiency. In Colquhoun (Ed.) Biological rhythms and human performance. New York: Academic Press, 1971, 39-107.

Conant, James Bryant. The education of American teachers. New York: McGraw-Hill, 1963.

Cooley, W. W., and Emrick, J. A. A model of classroom differences which explains variation in classroom achievement. Paper presented at American Educational Research Association meeting, Chicago, April 1974.

Cronbach, L. J., and Gleser, G. C. Psychological tests and personnel decisions. Urbana, Ill.: University of Illinois Press, 1957.

Cureton, G. Action reading: the participatory approach. Boston: Allyn and Bacon, 1973.

Davis, F. (Ed.). The literature of research in reading with emphasis on models. Washington, D.C.: Department of Health, Education and Welfare, 1971.

Davis, R. E., Buchwald, A. M., and Frankmann, R. W. Autonomic and muscular responses and their relation to simple stimuli. Psychological Monographs, 1955, 69, (No. 405).

de Charms, R. From pawns to origins: toward self-motivation. In G. S. Lesser (Ed.), Psychology and educational practice. Glenview, Ill.: Scott Foresman, 1971.

Di Vesta, F. J., et al. Instructional strategies: a model and its application. Annual Report. Part I. University Park, Penn.: Pennsylvania State University, 1971.

Donchin, E., and Lindsley, D. Average evoked potentials. National Aeronautics and Space Administration, SP-191, 1969, 400.

Dreeben, Robert. The nature of teaching. Glenview: Scott-Foresman, 1970.

Drohocki, Z. L'integrateur de l'électroproduction cérébrale pour l'éléctroencéphalographie quantitative. Revue Neurologique, 1948, 80, 619.

Feldman, C., Lee, B., McLean, J., Pillemer, D., and Murray, J. The development of adaptive intelligence. San Francisco: Jossey-Bass, 1974.

Festinger, L. Conflict, decision, and dissonance. Stanford, Calif.: Stanford University Press, 1964.

Fiske, D. W. Can a personality construct be validated empirically? Psychological Bulletin, 1973, 80, 89-92.

Fiske, D. W. The limits for the conventional science of personality. Journal of Personality, 1974, 42, 342-349.

Flavell, J. H. The developmental psychology of Jean Piaget. Princeton: Van Nostrand, 1963.

Garmezy, N. Children at risk: the search for the antecedents of schizophrenia. Part II: Ongoing research programs, issues and intervention. Schizophrenia Bulletin, National Institute of Mental Health, summer 1974, 9, 55-125.

Gelman, R. Conservation acquisition: a problem of learning to attend to relevant attributes. Journal of Experimental Child Psychology, 1969, 7, 167-187.

Geyer, J. Models of perceptual processes in reading. In Singer and Ruddell (Eds.), Theoretical models and processes of reading. Newark, Delaware: International Reading Association, 1970.

Glanzer, M. Storage mechanisms in recall. In Bower and Spence (Eds.), The psychology of learning and motivation: advances in research and theory. New York: Academic Press, 1971, 5, 129-193.

Goldstein, L., Murphree, H., Sugarman, A., Pfeiffer, C., and Jenney, E. Quantitative electroencephalographic analysis of naturally occurring (schizophrenic) and drug-induced psychotic states in human males. Clinical Pharmacology and Therapeutics, 1963, 4, 10-21.

Harlow, H. F. The formation of learning sets. Psychological Review, 1949, 56, 51-65.

Heider, F. Attitudes and cognitive organization. Journal of Psychology, 1946, 21, 107-112.

Henry, C. E. Electroencephalograms of normal children. Monograph of the Society for Research in Child Development, 1947, 9 (Serial No. 39).

Hess, E. Ethology and developmental psychology. In Mussen (Ed.), Carmichael's Manual of Child Psychology. New York: Wiley, 1970, 1, 1-38.

Hess, R. Suggestions submitted to Panel No. 3. Mimeo, 1974. See Appendix.

Hess, R. D., et al. Teacher strategies and student engagement in low-income area schools. Stanford Center for Research and Development in Teaching, R & D Memorandum No. 105, Stanford University, 1973.

Holloway, F. A., and Parsons, O. A. Physiological concomitants of reaction time performance in normal and brain-damaged patients. Psychophysiology, 1972, 9, 189-198.

Hord, D. J., Johnson, L. C., Lubin, A., and Austin, M. T. Resolution and stability in the autospectra of EEG. Electroencephalography and Clinical Neurophysiology, 1965, 19, 305-308.

Hunt, J. McV. Intrinsic motivation and its role in psychological development. In D. Levine (Ed.), Nebraska Symposium on Motivation. Lincoln: University of Nebraska Press, 1965.

Jansky, J. J., and de Hirsch, K. Preventing reading failure: prediction, diagnosis, and intervention. New York: Harper and Row, 1972.

Jencks, C., Smith, M., Acland, H., Bane, M., Cohen, D., Gintis, H., Heyns, B., and Michelson, S. Inequality. New York: Basic Books, 1972.

Johnson, L. C., Lubin, A., Naitch, P., Nute, C., and Austin, M. Spectral analysis of the EEG of dominant and non-dominant alpha subjects during waking and sleeping. Electroencephalography and Clinical Neurophysiology, 1969, 26, 361-370.

Kleitman, N. Sleep and wakefulness. Chicago: University of Chicago, 1963.

Koerner, James D. The miseducation of American teachers. Baltimore: Penguin, 1963.

Lacey, J. I. Somatic response patterning and stress: some revisions of activation theory. In Appley and Trumbull (Eds.), Psychological stress: issues in research. New York: Appleton-Century-Crofts, 1967.

Lesser, G. S. Matching instruction to student characteristics. In G. S. Lesser (Ed.), Psychology and educational practice. Glenview, Ill.: Scott Foresman, 1971.

LeVine, R. Cross-cultural study in child psychology. In Mussen (Ed.), Carmichael's Manual of Child Psychology. New York: Wiley, 1970, 2, 559-612.

Levinson, D. J., Darrow, C. M., Klein, E. B., Levinson, M. H., and McKee, B. The psychosocial development of men in early adulthood and the mid-life transition. In Ricks, Thomas and Roff (Eds.), Life history research in psychopathology. Minneapolis: University of Minnesota, 1974, 3.

Lindsley, D. B. Basic perceptual processes and the EEG. Psychiatric Research Reports, 1956, 6, 161-170.

Luria, A. R. The frontal lobes and the regulation of behavior. K. H. Pribram and A. R. Luria (Eds.), Psychophysiology of the frontal lobes. New York: Academic Press, 1973.

Lykken, D., Tellegen, A., and Thorkelson, K. Genetic determination of EEG frequency spectra. Biological Psychology, 1974, 83, 268-277.

Mackworth, J. Some models of the reading process: learners and skilled readers. In Davis (Ed.), The literature of research in reading with emphasis on models. Washington, D.C.: Department of Health, Education and Welfare, 1971, 67-100.

Maehr, M. L., and Sjogen, D. D. Atkinson's theory of achievement motivation: first step toward a theory of academic motivation. Review of Educational Research, 1971, 41, 143-161.

Mandler, G. The interruption of behavior. In D. Levine (Ed.), Nebraska Symposium on Motivation. Lincoln: University of Nebraska Press, 1964.

Marcus, L. M. Studies of attention in children vulnerable to psychopathology. Unpublished Ph.D. dissertation, 1972, University of Minnesota, Minneapolis.

Mead, G. H. Mind, self, and society. Chicago: University of Chicago, 1934.

Morton, A. R. The impact of changes in selected teacher strategies on expressive student engagement. Stanford Center for Research and Development in Teaching, Technical Report No. 34, Stanford University, 1973.

Mosteller, F., and Moynihan, D. P. (Eds.), On equality of educational opportunity. New York: Random House, 1972.

Neisser, U. Cognitive psychology. New York: Appleton-Century-Crofts, 1967.

Obrist, P. A., Webb, R. A., Sutteror, J. H., and Howard, J. L. Cardiac deceleration and reaction time: an evaluation of two hypotheses. Psychophysiology, 1970, 6, 695-706.

Orr, W. C., and Hoffman, H. J. A 90-minute cardio-biorhythm: methodology and data analysis using modified periodograms and complex demodulation. IEEE Transactions on Biomedical Engineering, BME-21, 1974, 130-143.

Orr, W. C., Hoffman, H. J., and Hegge, F. W. Methods of biorhythmic analysis in the assessment of human performance. Annals of the New York Academy of Sciences, 1974, in press.

Osgood, C. E., and Tannenbaum, P. H. The principle of congruity in the prediction of attitude change. Psychological Review, 1955, 62, 42-55.

Perry, W. G. Forms of intellectual and ethical development in the college years. New York: Holt, Rinehart and Winston, 1970.

Piaget, J. Play, dreams and imitation in childhood. New York: Norton, 1962.

Pierson, D. E. Measuring attention in the classroom. Unpublished Ph.D. dissertation, Harvard University, 1970.

Preston, M. S., Guthrie, J. T., and Childs, B. Visual Evoked Responses (VERs) in normal and disabled readers. Psychophysiology, 1974, 11, 452-457.

Price-Williams, D. R., Gordon, W., and Ramirez, M. Skill and conservation: a study of pottery-making children. Developmental Psychology, 1969, 1, 769.

Rashid, M. The teacher, teacher style, and classroom management. In E. Grotberg (Ed.), Critical issues in research related to disadvantaged children. Princeton: Educational Testing Service, 1968.

Resnick, L. B. Teacher behavior in an informal British infant school. Paper presented at the annual meeting of the American Educational Research Association, New York, February 1971. (ERIC, ED059181).

Rist, R. C. On the social and cultural milieu of an urban black school: an ethnographic case study. Paper presented to the Sociology of Education Panel of the Pacific Sociological Association, Portland, Oregon, April 1972. (ERIC, ED066523).

Rosenshine, B. Teaching behaviors and student achievement. London: International Association for the Evaluation of Educational Achievement, 1971.

Ryan, K. (Ed.). Don't smile until Christmas: accounts of the first year of teaching. Chicago: University of Chicago Press, 1970.

Satz, P., and Friel, J. Some predictive antecedents of specific disability: a preliminary two-year follow-up. Journal of Learning Disabilities, 1974, 7, 437-444.

Satz, P., et al. An evaluation of a theory of specific developmental dyslexia. Child Development, 1971, 42, 2009-2021.

Schultz, C. B. The effects of uncertainty, confidence and individual differences on the initiation and direction of information-seeking behavior. Unpublished doctoral dissertation, Pennsylvania State University, 1970.

Science Research Associates, Reading program. Chicago: Science Research Associates, 1970.

Scribner, S., and Cole, M. Cognitive consequences of formal and informal education. Science, 1973, 182, 553-558.

Shankweiler, D. and Liberman, I. Y. Misreading: A search for causes. J. F. Kavanagh and I. G. Mattingly (Eds.), Language by Ear and by Eye. Cambridge: MIT Press, 1972.

Sharpless, S., and Jaspar, H. H. Habituation of the arousal reaction. Brain, 1956, 79, 655-680.

Singer, H., and Ruddell, R. (Eds.). Theoretical models and processes of reading. Newark, Delaware: International Reading Association, 1970.

Smith, B. O. Teachers for the real world. Washington, D.C.: American Association of Colleges for Teacher Education, 1969.

Smith, E. E. Choice reaction time: an analysis of the major theoretical positions. Psychological Bulletin, 1968, 69, 77-110.

Smith, L. M., and Geoffrey, W. The complexities of an urban classroom. New York: Holt, Rinehart and Winston, 1968.

Sorenson, J. S., Schwenn, E. A., and Baury, J. L. The use of individual and group goal setting conferences as motivational devices to improve student conduct and increase student self-direction: a preliminary study. Wisconsin Research and Development Center for Cognitive Learning, Technical Report No. 1231, University of Wisconsin, March 1970.

Sroufe, L. A., Sonies, B. C., West, W. D., and Wright, F. S. Anticipatory heart rate deceleration and reaction time in children with and without referral for learning disability. Child Development, 1973, 44, 267-273.

Stephens, J. M. The process of schooling. New York: Holt, Rinehart and Winston, 1967.

Sternberg, S. Memory scanning: mental processes revealed by reaction-time experiments. American Scientist, 1969, 57, 421-457.

Sternberg, S. The discovery of processing stages: extensions of Donders' method. Acta Psychologia: Attention and Performance, 1969 (W. G. Koster, Ed.), 30, 276-315.

Stevens, J., Lonsbury, B., and Goel, S. Electroencephalographic spectra and reaction time in disorders of higher nervous function. Science, 1972, 176, 1346-1349.

Surwillo, W. W. The relation of response-time variability to age and the influence of brain wave frequency. Electroencephalography and Clinical Neurophysiology, 1963, 15, 1029-1032.

Sutton, S., Braren, M., and Zubin, J. Evoked-potential correlates of stimulus uncertainty. Science, 1965, 150, 1187-1188.

Takanishi-Knowles, R. Collaboration between educational researchers and school personnel: some reflections and proposals for reducing the research-to-practice gap. Paper presented at the meeeting of the American Educational Research Association, New Orleans, February 1973.

Tharp, V. K. Jr., Rundell, O. H. Jr., Lester, B. K., and Williams, H. L. Alcohol and secobarbital: effects on information processing. In Advances in experimental medicine and biology. New York and London: Plenum Press, in press.

Walter, D. O. Spectral analysis for electroencephalograms: mathematical determination of neurophysiological relations from records of limited duration. Experimental Neurology, 1963, 8, 155-181.

Walter, G., et al. Contingent negative variation: an electric sign of sensorimotor association and expectancy in the human brain. Nature, 1964, 23, 380-384.

Weiner, B. Motivation. In R. Ebel (Ed.), Encyclopedia of educational research. New York: Macmillan, 1969.

Weiner, E. Suggestions submitted to Panel No. 3. Mimeo, 1974. See Appendix.

White, R. W. Motivation reconsidered: the concept of competence. Psychological Review, 1959, 66, 297-333.

White, S. H., Day, M. C., Freeman, P., Hantman, S., and Messenger, K. Federal programs for young children. Washington, D.C.: Department of Health, Education and Welfare, 1973.

Williams, H. L., Granda, A. M., Jones, R. L., Lubin, A., and Armington, J. D. EEG frequency and finger pulse volume as predictors of reaction time during sleep loss. Electroencephalography and Clinical Neurology, 1962, 14, 64-70.

Williams, H. L., Lubin, A., and Goodnow, J. J. Impaired performance with acute sleep loss. Psychological Monographs, 1959, 73, No. 14 (Whole No. 484).